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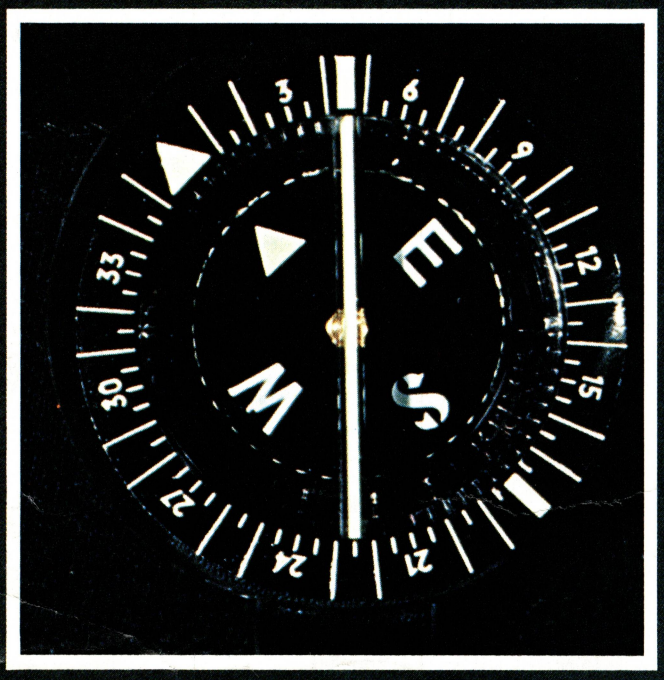
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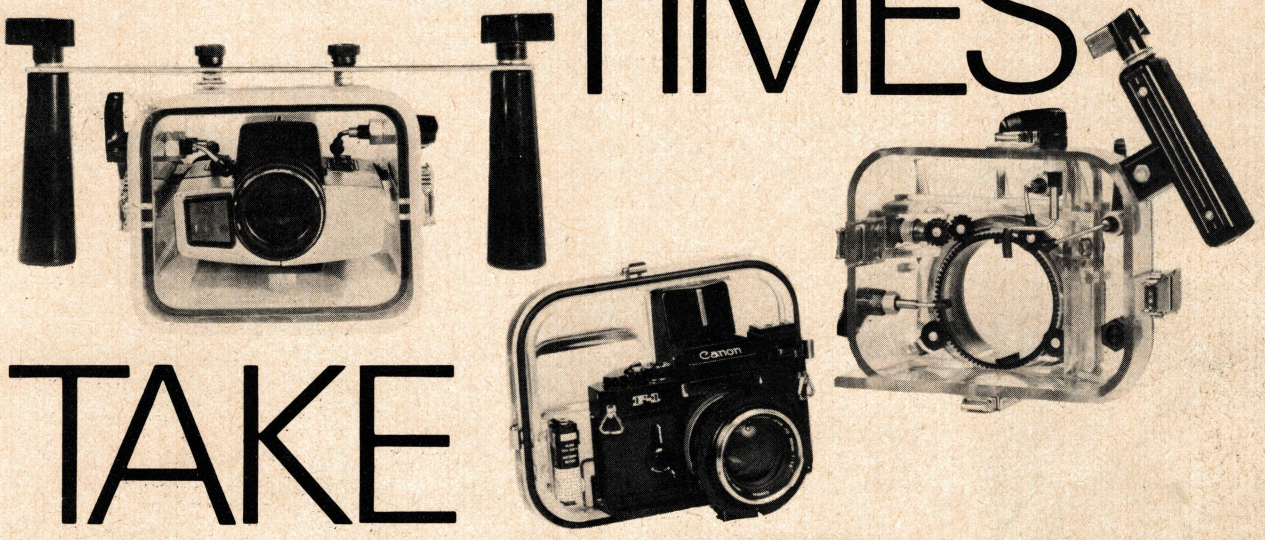
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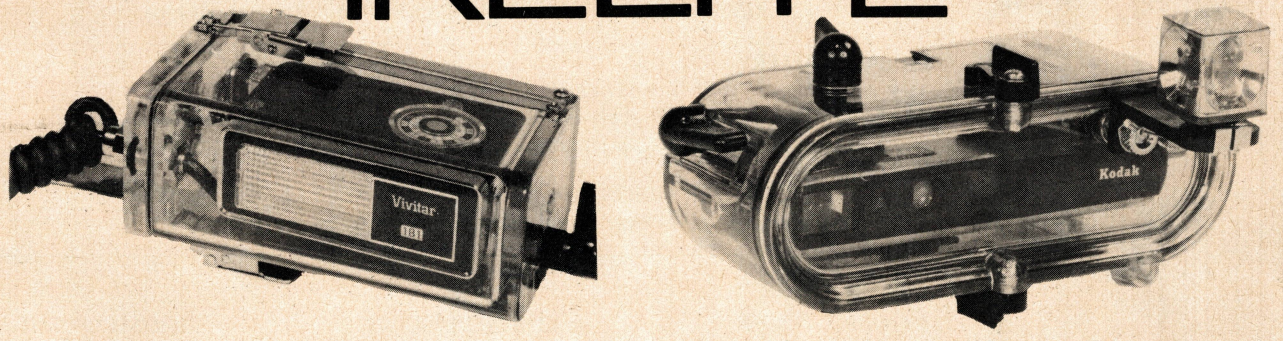
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Cover – U/W guide Charlie George hand-feeds one of the friendly French angelfish on Angel Reef, Tobago, West Indies. Photograph taken by Paul Tzimoulis using a Nikonos II camera, Seacor 21mm lens, and a Mark 150 Subsea strobe. For more about diving in Tobago see story on page 66.

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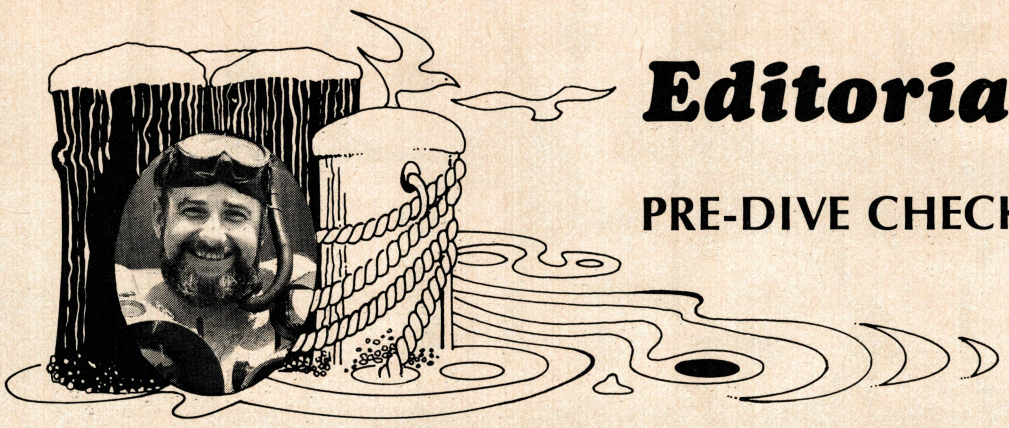
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Editorial

PRE-DIVE CHECKLIST . . .

by the Publisher

In the haste of today's busy world, far too many divers are finding themselves out to sea on a dive boat with either broken or forgotten gear. Their much dreamed about dive trip is possibly ruined by some simple malfunction such as a broken mask strap or busted wet suit zipper.

The sea and the ocean environment are especially hard on equipment of any kind — and diving equipment is no exception. A constant vigil of inspection and home maintenance are important to the success of your dive trips.

One of the best ways to avoid unexpected breakdowns is to develop a pre-dive checklist, similar to the preflight checklist utilized by aircraft pilots all over the world. This handy reminder provides a point-by-point list of the subtle symptoms which could spell trouble for your dive trip.

Here are just a few items you might put on your checklist:

☐ **MASK** - Check the head strap for signs of deterioration, especially around the buckle area. If it looks suspicious, replace the strap or carry along a spare.

☐ **SNORKEL** - Make sure the lower portion (mouthpiece section) is solidly glued to the upper portion. Snorkels have a habit of coming apart underwater when you're on scuba.

☐ **FINS** - Check the heel straps for weathering or rubber deterioration. Replace them before they start breaking. Also check the fin blades for cracking or splitting.

☐ **DIVE KNIFE** - Check the straps for wear. Also be certain the retainer ring is holding the knife in the scabbard securely.

☐ **SAFETY VEST**-Check that CO^2 inflator mechanism to see if it is functioning properly and generously lubricate the moving parts and cartridge threads with silicone grease. Inflate the vest to check for pinhole leaks or tears in the vest seams.

☐ **WET SUIT** - Make sure all zippers are moving freely and lubricate them with silicone. Check the suit for tears at the seams — especially in the armpit and crotch area.

☐ **WEIGHT BELT** - Be sure you have sufficient lead weights to maintain neutral buoyancy at 10 feet, and that belt buckle is functioning properly.

☐ **REGULATOR** - Attach it to your tank and make sure it is working properly. Check the exhaust valve function to be sure it isn't stuck shut. Also, check the sintered filter to make sure it isn't green with corrosion.

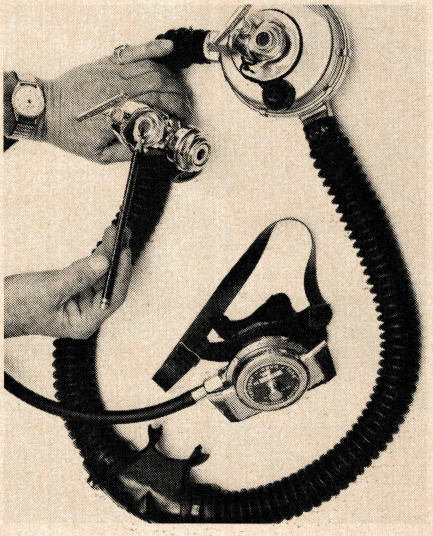
☐ **SUBMERSIBLE PRESSURE GAUGE** - Check to be sure it is not leaking air, and that the needle indicator moves smoothly when you turn on the air. Also check the pressure reading against another pressure gauge to be sure your SPG is reading accurately.

☐ **TANK** - Check to be sure it is filled to its rated capacity. Make sure the tank valve turns on and off smoothly and easily. If the valve knob turns hard, it needs an overhaul and cleaning.

☐ **TANK PACK** - Make sure the tank band and tightening device are not cracked or corroded. Check the harness for missing parts.

☐ **DEPTH GAUGE** - Make sure the strap is not cracked or weathered. Also check the needle indicator to be sure it's not stuck. You can squeeze the back of most oil-filled gauges to make the needle move.

☐ **DIVE WATCH** - Make sure the bezel is not loose and spinning around too easily. Keeping accurate track of your bottom time is absolutely vital.



Follow this simple checklist one or two days prior to every dive trip and you'll happily find far less chances of equipment failures or breakage on your dives. In order to dive safely, a diver must be confident that *all* of his equipment is functioning perfectly.

Still another side benefit of using a checklist is that it minimizes chances of forgetting to pack a piece of your gear.

Make up your own pre-dive trip checklist now. Have it sealed in plastic if you like, and keep it handy in your dive bag or dive locker. The important thing however, is to use it *everytime* you plan to go off on a trip.


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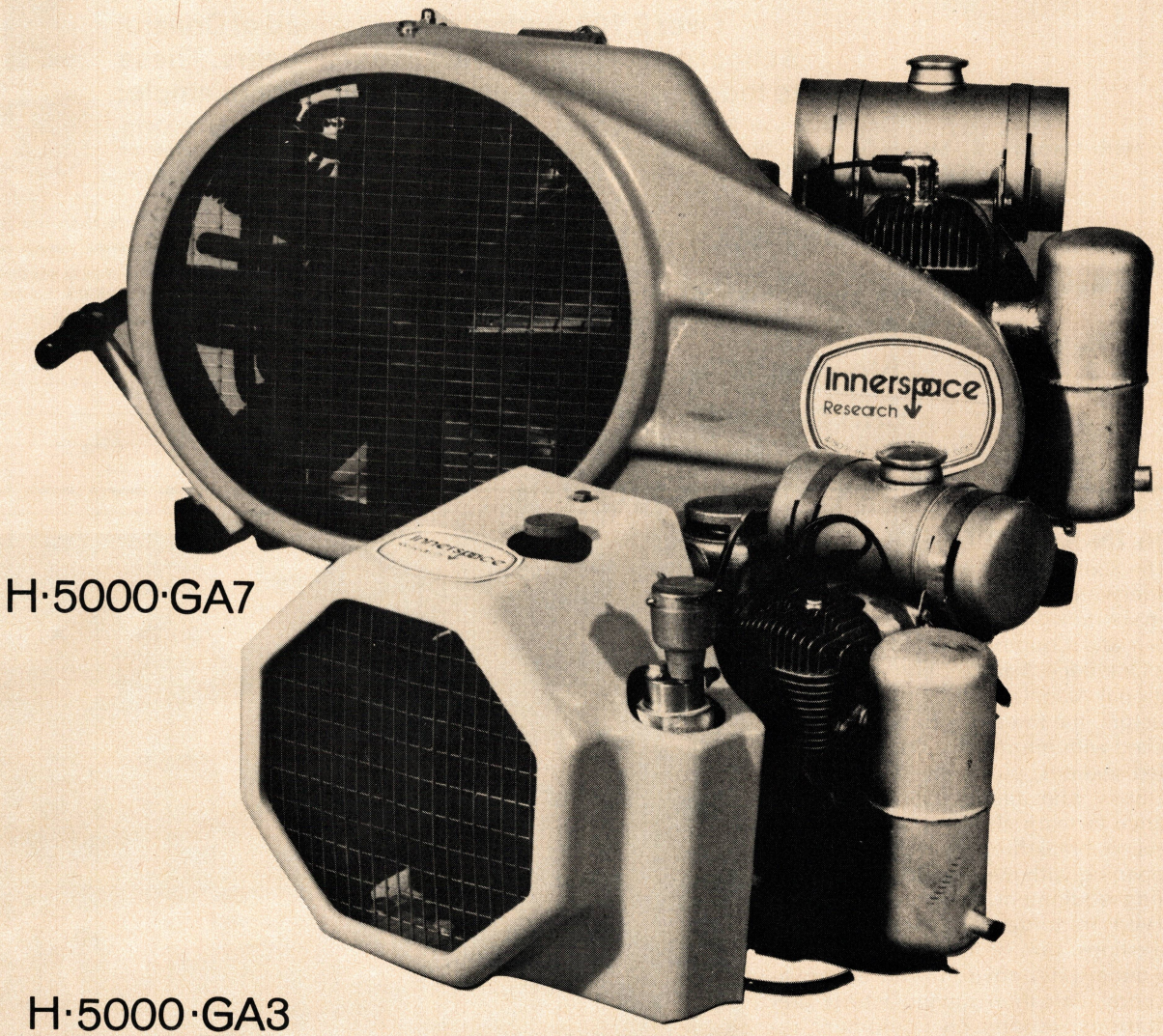
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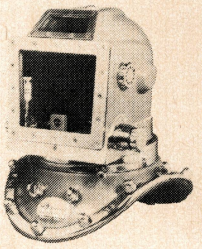
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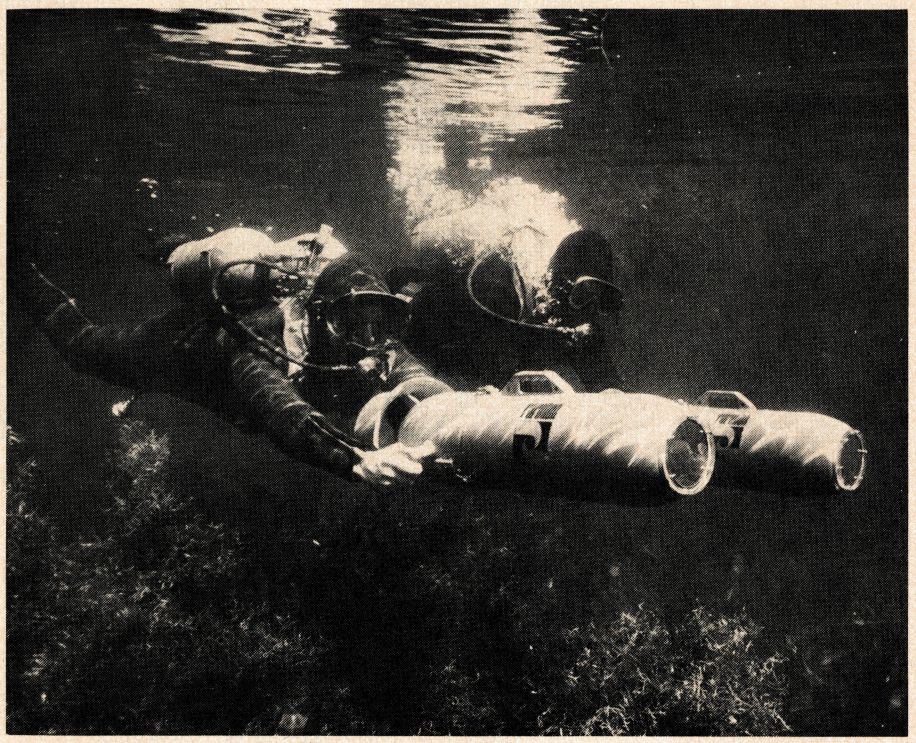
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IQ6 IN SAN DIEGO

The Sixth International Conference on Underwater Education (abbreviated, then shortened to IQ6) will be held at the Town and Country Hotel in San Diego this October 4, 5 and 6. Sponsored by the National Association of Underwater Instructors, the three day program will be packed with informative general and divided sessions, plus workshops.

Divers who attend IQ6 will have a chance to learn about the new decompression breakthrough, find out what's happening with meters and push-button diving equipment, become totally involved in underwater photography workshops, turn on to presentations on the underwater environment, underwater communications, manufacturer presentations, reports on equipment research and development, safety and accident findings, instructional methods and procedures.

Besides the seminars, the exhibits at IQ6 will be the biggest ever, with over 100 manufacturers, distributors, agencies, retailers and related organizations bringing their latest and most important items for divers. And there will be an underwater film festival MC'd by Stan Waterman, who will present his latest work, *Chambers of the Sea*. Film show attendees will also be treated to a behind the scenes look at Cornell Wilde's latest film *Treasure*.



A great deal of effort has been made to make attendance easy for divers. Special travel fares, airport shuttle service, rental car discounts, and family tours have been set up, as well as a number of post-conference dives which are scheduled both locally and to the world's greatest diving spots — Tahiti, Puerto Vallarta, Cozumel, Stella Maris, the Kona Coast — all designed by divers for divers.

For further information and advanced registration forms, write to: IQ6, NAUI Headquarters, 22809 Barton Road, Colton, California 92324.

Driftwood

. . . Many thanks for the interesting article, "Take Five." While it seems undeniable that the overall impact of the article will be for the betterment of the diving community, please allow one suggestion which I think could vastly improve the quality of the article.

Uncalled for decompression—with consequent increased uptake of nitrogen in some body tissues—is an unsafe practice, unless the diver adds the stop to his bottom time.

Certainly for most situations (like you especially refer to — deep dives approaching the limit for decompression) the omission of taking it into account will result in a small unsafety — perhaps only the straw that broke the camel's back.

Literally, the information is absolutely correct as you presented it—however, few divers would bother to add the "Take Five" to the bottom time, as is required by a literal and practical interpretation of the U.S. Navy Tables. Of course, if this is the last dive in a 12 hour period, the adding to bottom time of unscheduled stops is not required and definitely increases safety without reservation.

FRANK PARRISH WICHITA FALLS, TEXAS

. . . Regarding the write up in the June issue on our new school—I'm afraid the printer's devil slipped in because our summer rate was quoted as $323 instead of $232. Is there any possibility of a correction being printed?

DAVID HEATH MONTEGO BAY, JAMAICA

Editor's Note: The summer rate of $232 refers to an eight day package at the Jamaica School of Swimming, Skin and Scuba Diving in Montego Bay, Jamaica. Based on double occupancy, this includes: airport transfers, air conditioned hotel room, breakfasts, the full PADI scuba course and unlimited diving after the sixth day. For more information contact: Jamaica School of Swimming, Skin and Scuba Diving, P.O. Box 469, Montego Bay, Jamaica.

. . . In January of this year you published an article of mine entitled, "Be safe, rather than rescued." We have had a lot of inquiries about the training manual we use. At that time our manual was not up to par, so I wrote a new one, and it is now ready. It will be mailed to those who want one for a contribution of $4.25. Address all correspondence to Mr. Jim Morgan, 1330 Boone St., Boone, Iowa 50036. The price includes postage and handling.

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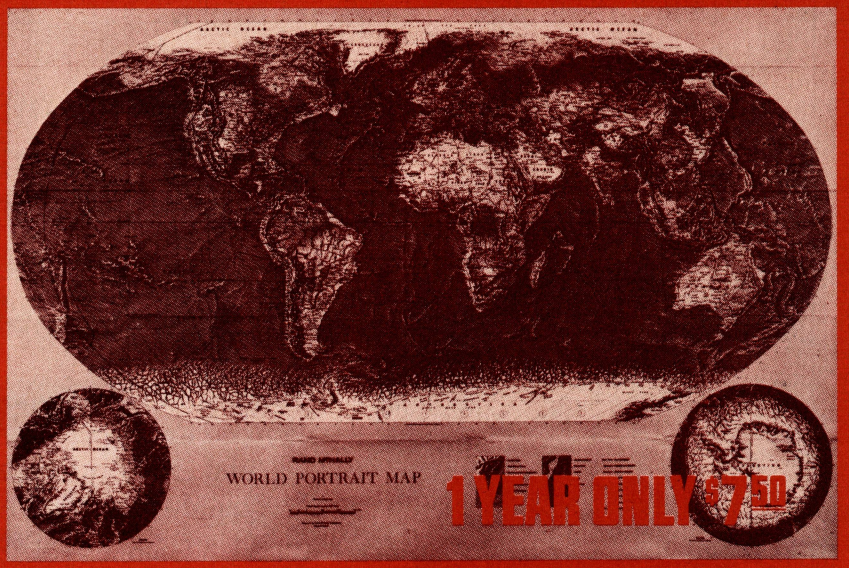
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Driftwood

. . . Your recent editorial concerning spearfishing has obviously raised a great deal of controversy. At this time, the Hawaii Council of Diving Clubs wishes to express its opinion. At a recent council meeting, the majority of club representatives present passed on a resolution that a letter be written to SKIN DIVER expressing the council's position in favor of spearfishing.

It is self evident that Hawaii is a marine oriented state. It has a plethora of ecology oriented groups who have a common goal in preserving the marine environment and in battling those elements in the state responsible for marine pollution from sewage outfalls, soil erosion, etc. If these elements had practiced ecological conservation earlier there would be less worry today concerning the fish population and the effects of commercial fishing and spearfishing by a minority of divers. Hawaii has a very high cost of living. Many individuals in the resident population augment their table fare with fish caught with poles, lines, throw nets, and by spearfishing. Admittedly there are probably a few resident divers who "poke" fish solely for the so-called "sport" of it. But the vast majority cannot be condemned for the action of a few irresponsible individuals.

It is realized that there is "visibility" in attacking a small category of individuals responsible for a minute reduction in the fish population. It is the council's hope that more fervent effort will be directed toward the categories which are responsible for the adverse environmental conditions causing the largest reduction in the fish population.

ROBERT REED HONOLULU, HAWAII
HAWAII COUNCIL OF DIVING CLUBS

. . . I thought you might like to know we are doing something about the inadequacies of recompression chamber services on Maui. Hawaii has only one readily available chamber—at Pearl Harbor. Bends victims on the out-islands may have a 2-3 hour delay before obtaining treatment.

Another doctor, a lawyer and myself have formed a non-profit corporation, Maui Recompression Chamber Services Inc., in order to collect funds for the purchase and operation of a chamber. We plan to install it in Kaiser Lahaina Clinic, and donate our work so that we can offer the service at minimal or no cost. A very important component of our work will be diver education, hopefully to prevent future bends cases.

Should any reader like to contribute, our address is Maui Recompression Chamber Service; P.O. Box 1578; Lahaina, Maui, Hawaii 96761.

STEVEN STRONG, M.D.
MAUI, HAWAII

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. . . Regarding the article, "The Playful Porpoises," in the February issue of SKIN DIVER, I would like to comment that the photos are the best in existence of spotted porpoise from the Atlantic. As such, they are very important scientifically. As I told you, I, together with Drs. Ed Mitchell of Environment Canada, P. J. H. van Bree of the University of Amsterdam and W. H. Dawbin of Sydney University, am trying to work out the systematics of these animals. At present, there is no agreement on how many species of spotted porpoise exist in the Atlantic. Your pictures are of one of what I believe are two species. This form on the U.S. East Coast has been called *Stenella plagiodon* (Cope, 1866). Knowledge of details of the color patterns in animals from different parts of the Atlantic is important in working out the puzzle, and your photos of course show the patterns beautifully.

WILLIAM F. PERRIN — LA JOLLA, CALIF.
FISHERY BIOLOGIST — U.S. DEPT. OF COMMERCE

DIG FORMED

Divers in Government (DIG) is a new legislative watchdog group formed by the Underwater Society of America. A DIG committee will be established within every state and will consist of three major representatives: citizen-diver, manufacturers and shops, and national instructional agencies. The groups would make available to state agencies and legislatures the information needed on scuba to influence legislative action that would affect the sport. Each DIG committee will establish their credentials and visit each state agency as a State Scuba Advisory Committee. The Underwater Society of America will prepare an operating manual for each state committee, which will be available from Society headquarters in Ambler, PA 19002.

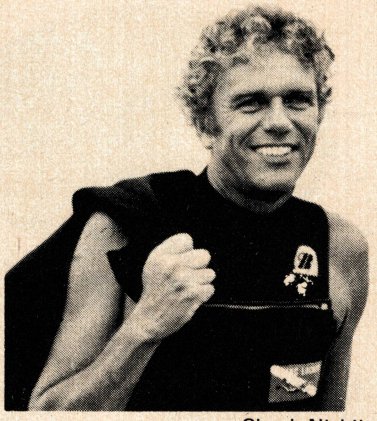
Calendar

September 21
NAUI U/W Film Review, Fall Edition, John Hancock Hall, Boston, 8 p.m. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Mass. 02117)

October 4-6
NAUI 6th International Conference on Underwater Education, San Diego, Calif. (Contact: NAUI Hdqrs., 22809 Barton Rd., Colton (Grand Terrace), Calif.)

November 9
NAUI Underwater Symposium & Film Review, Philadelphia, Pa. (Contact: NAUI Mid-Atlantic Branch, P.O. Drawer C, Deepwater, N.J. 08023)

November 23-24
3rd International Skin Diving Film Competition, Berlin. (Contact: Robert Haberling, D 1000 Berlin 37, Heimat 33)


Chuck Nicklin

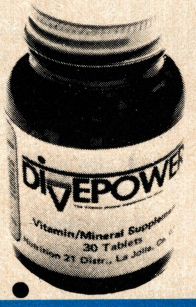
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Technifacts from a Master Diver

BY E. R. CROSS

The basic purpose of this column is to stimulate an interest in the technical aspects of diving and will be devoted to providing factual answers to questions from SKIN DIVER readers. Answers will be designed to apply to the majority of diving situations, problems, and equipment in use today. Single subject questions are best suited to Technifacts and may be on any subject related to diving. Watch for your answers in Technifacts.

For their questions or comments used in this month's Technifacts I would like to thank William Bayless, Islip Terrace, N. Y.; Stephen Scharon, St. Louis, Mo.; Randolph McGhee, Buffalo, N. Y.; Ben Tomblinson, Madisonville, Ky.,Charles L. Curry, FPO San Francisco, Ca.; Jung yom Shik, Inchon, Korea; Robert Schueler, Buffalo, N. Y.; and Stan C. Riest, Camp Borden, Ontario, Canada.

In last month's Technifacts, questions were answered about simple closed circuit scuba systems. As pointed out this type scuba can be either a pendulum or recirculating system. However, to be classed as a simple type closed circuit unit it must use pure oxygen as the type of breathing gas.

The basic components of either a pendulum or a recirculating type closed circuit scuba are approximately the same. Normally they require a cylinder of pure oxygen, at least one control valve, a rebreathing bag, a mask or mouthpiece, a cannister of carbon dioxide absorbent, and the necessary breathing hoses. The arrangement of these components varies considerably in the various models of closed circuit scuba available. They are particularly variable in the models from different countries of origin. However, each component performs the same function regardless of manufacturer or country of origin.

The method of controlling the flow of oxygen from the high pressure cylinder to the breathing bag also varies considerably in the several available units. Always there is a high pressure cylinder valve. Generally there is also a high pressure needle valve that meters small amounts of oxygen into the breathing bag system. These two valves are, of course, connected together by high pressure tubing or hoses. However, between the needle valve and the breathing bag it isn't necessary to use high pressure hose.

There are also units that use a pressure reducing regulator between the oxygen cylinder and the control (needle) valve.

This regulator is similar to the pressure reducing regulator system in open circuit scuba. Its purpose is to reduce the relatively high oxygen pressure in the cylinder before it becomes necessary to regulate flow of oxygen into the breathing bag of the scuba. In other models, the Italian Cressi unit and in one of the U. S. Emerson units, automatic demand type regulators (the Emerson unit is equipped with double demand regulators) are actuated by the flattening of the breathing bag to cause flow of additional oxygen into the system.

The basic purpose of any valve or regulator system in closed circuit scuba is to provide the proper amount of oxygen in the breathing bag so the diver, on inhalation, has ample oxygen in the system to permit him to take a full, resistance free breath of oxygen.

One factor that contributes to the simplicity of a simple closed circuit scuba is that pure oxygen is used as a breathing gas. When such a system has been properly purged, and when the diver's respiratory system has been properly purged, the use of pure oxygen from the unit produces a volume change (decrease) equal only to the amount of oxygen used by the diver's body in metabolic processes. At all times there is no gas except oxygen in the system. A need for more gas (oxygen) in the breathing bag is indicated when, on inhalation, the breathing bag is completely collapsed just prior to the completion of the inhalation cycle of breathing. The diver then opens the needle valve and allows more oxygen to flow into the breathing bag and can then continue his dive. In the case of automatic demand valve systems, the oxygen valve would have been actuated automatically prior to complete collapse of the bag. In any case the amount of oxygen required in the breathing bag is basically dependent on the metabolic needs of the diver dictated by amount of exercise and other factors.

If a similar closed circuit scuba were filled with a mixed gas, say nitrogen and oxygen, the oxygen consumption by the diver would be the same for a given amount of exercise as in a pure oxygen unit. The volume of oxygen in the breathing bag would decrease just as it did in the closed circuit unit using pure oxygen. However, the total volume of gas in the unit using mixed gas would not decrease in the same proportion as in the unit using pure oxygen. There could, as a result of this, be a critical shortage of oxygen in the breathing bag even though the diver might be able to inhale freely.

Complex closed circuit scuba — To overcome the potentially hazardous feature of decreasing oxygen in a mixed gas closed circuit scuba, complex closed circuit units have been developed.

(Continued on Page 80)

umi DIVER



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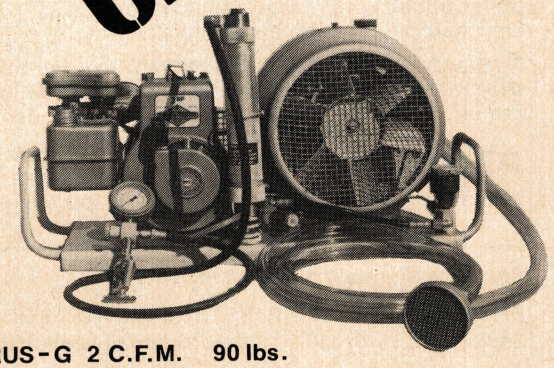
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TENTH ANNUAL SAN DIEGO U/W FILM FESTIVAL

The tenth annual San Diego Underwater Film Festival will be presented this September 27 and 28 in the Civic Theater, Community Concourse, San Diego. The two day event, with a completely different show each night, will be MC'd by Ron and Valerie Taylor of Australia.

Ron Taylor, Australian Spearfishing Champion many times and World Spearfishing Champion in 1965, is also credited with filming the first underwater shark hunting film which was released as a TV documentary. He has numerous film credits as cameraman and director, and he is a past recipient of the Underwater Photographer of the Year award presented at the Santa Monica Film Festival.

Valerie Taylor is an accomplished writer and photographer whose articles have appeared in magazines all over the world. She, too, has won a number of diving championships including the Australian and New South Wales Spearfishing Championship and the Australian Women's Scuba Championship. Both Ron and Valerie were principal divers in Peter Gimbel's film *Blue Water – White Death*. Since then they have had their own TV series syndicated in the United States and are currently at work filming segments for the movie *Jaws*.



In addition to the film footage the Taylors will be bringing with them, films and their makers will be presented from all over the world. Additionally, UPS member slides will be shown, as well as a print display in the lobby.

The goal of the San Diego Underwater Film Festival is to represent an important event in cultural and technological history by being a focal point for the photographic record of man's scientific research, exploration and development of innerspace, the underwater world. It has succeeded admirably in the past, and this year's show should be better yet.

Show time, both Friday and Saturday nights, is 8 pm. Tickets for each program are $3.50, and may be purchased through the Civic Theatre Box Office or at San Diego area dive shops. For further information, contact: UPS, Box 82782, San Diego, Calif. 92138.

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September 30/January 13

INWARD TO THE SEA

WASHINGTON, D.C.

The third annual Inward to the Sea program will take place September 20 and 21, 1974. The event will be kicked off with a cocktail party and reception Friday evening, September 20, in the ballroom of the Ramada Inn, 1900 N. Fort Myer Drive, Rosslyn, Virginia (just across the Key Bridge from Washington, D.C.). At the party divers will have a chance to meet informally with the speakers, film makers and divers who make Inward to the Sea possible.

On Saturday, September 21, from 9:30 am to 5 pm, there will be diving related seminars in the ballroom of the Marvin Center on the George Washington University Campus, 21 and H Streets, NW, Washington, D.C. These seminars will cover a variety of topics including: The Search for the Monitor; Arctic Diving; Photography Beneath the Ice; Diving Psychology; and Navy Diving Programs. Speakers scheduled at the seminars are



Admiral Walter N. Dietzen

Admiral Walter N. Dietzen, coordinator of Deep Submergence Systems; Commander Colin Jones, commanding officer of the Navy Experimental Diving Unit; Rick Mason of the MacInnis Foundation; and Dr. Art Bachrach, renowned diving psychologist.

Starting at 7:30 pm, Saturday, September 21, the underwater film show will be held at the Lisner Auditorium on the George Washington University Campus. Films to be presented include: *Fire Under the Sea*, Lee Tepley's exciting film which captures the natural spectacular of a volcanic eruption and the unusual effects on the marine environment when lava flows into the sea; *Beluga Whale*, Joe MacInnis' fascinating study of the white whale; *Jersey Graveyard of Ships*, Smokey Roberts' feature for wreck diving buffs; and *How SCUBA was Made*, Kit and Brooks Flieg's presentation of some behind the scene views of their feature length film about diving.

Tickets are $5 for the party, $3 for the seminars and $4 for the film festival. Contact: Inward to the Sea, P.O. Box 41010, Washington, D.C. 20014.

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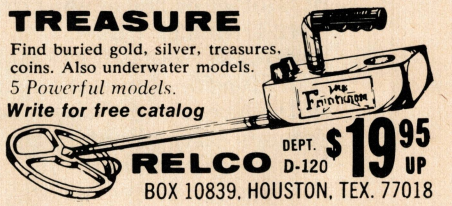
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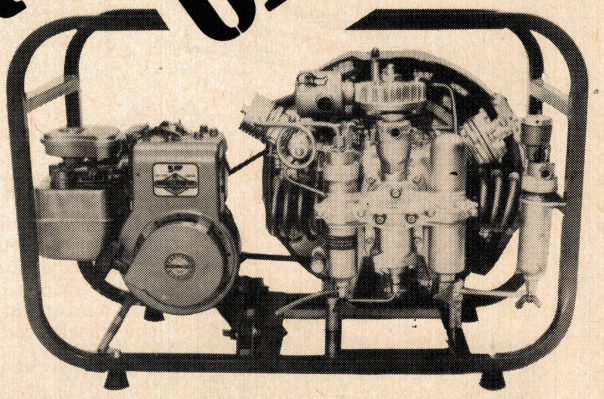
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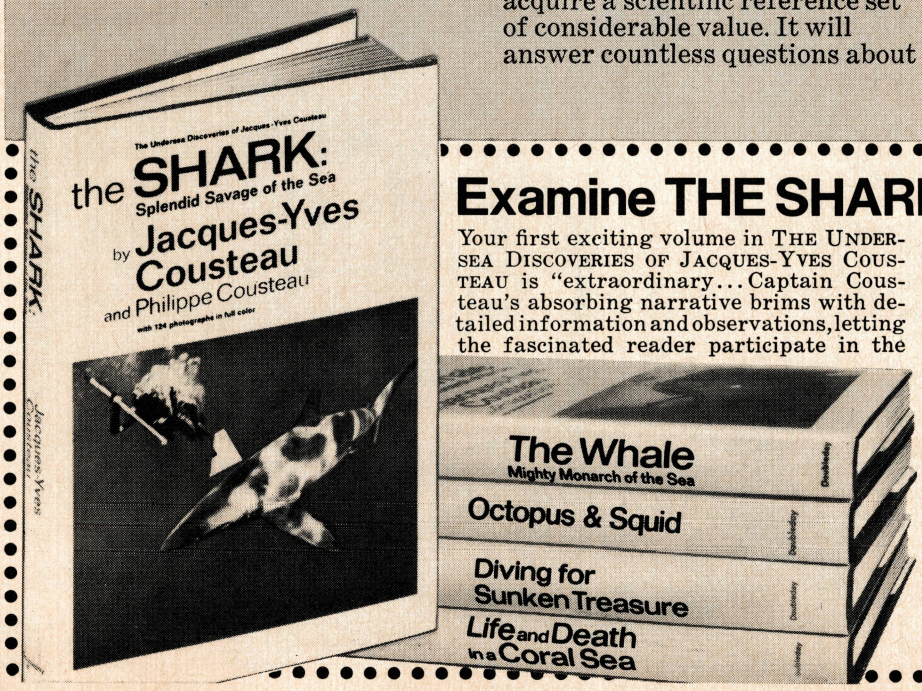
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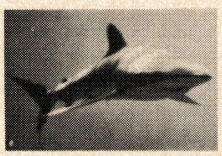
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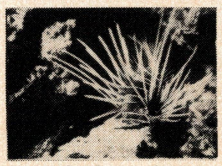
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"An ounce of prevention is worth 2250 psi"

By Jack McKenney

No doubt you've heard one or two stories about steel diving cylinders blowing up while under pressure and demolishing everything within ten to fifteen yards. According to John McAniff of the University of Rhode Island, there is approximately one authenticated report of this type of accident happening about every year and a half. One, which happened in New Jersey a few years ago involved an eight year old tank which had passed a hydro test 16 months prior to the accident. When the cylinder blew at just over 2000 psi it was laid open "banana-peel" fashion. The 3/8" sheet steel water cooling container shrapneled into many pieces, one of which was later found more than 200 feet away outside the building. Both outer cement block walls of the filling bunker, which were filled and reinforced with steel rods, crumbled.

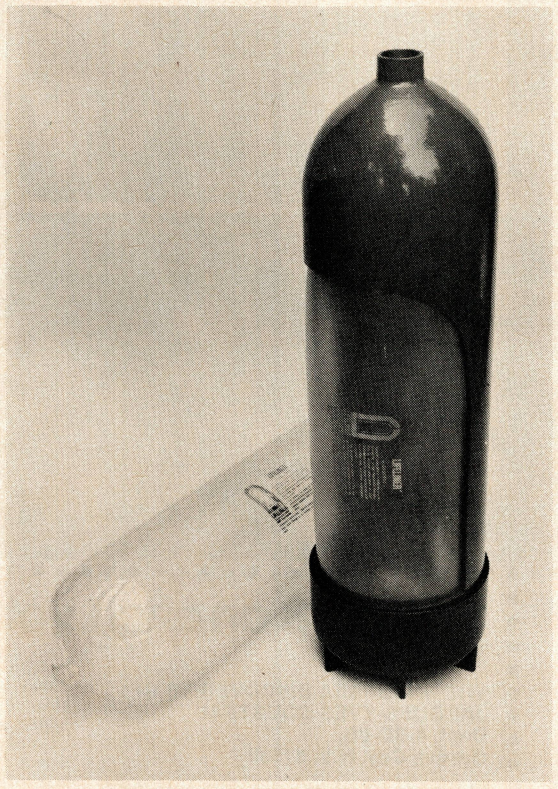
Al Thompson of Professional Scuba Repair in Los Angeles told me of another case, where due to negligence on the part of the owner, a new tank had so much water in it that it burst just six months after the company's manufacturing date.

In all cases, when the tanks are inspected after the blast, they are found to be so corroded and permeated with rust that it's a wonder they don't explode long before they do. Ready to hang up your scuba tank and call it a day? Don't. When you consider the thousands of diving cylinders that are currently being used every day under all sorts of diving conditions, these few incidents reflect a very small percentage of diving accidents within our sport diving industry.

I think it's a credit to our professional dive shops and scuba repair services through their yearly visual inspection programs that our "high pressure" sport maintains the fine safety record that it does. Only by removing the tank valve and looking into a cylinder can it be determined if corrosion is present and whether or not it has been discovered early enough to clean the cylinder and DOT approve it for another five years..But it's up to you, the diver, to faithfully have your tank VIP'd on a regular basis.

Take a look at a piece of steel that has been sitting outside for just a day. Moisture in the air alone is enough to begin the corrosion process, and if there's a slight rain, a heavy brown rust will form. Well, the same thing can happen in your diving cylinder. Water can accumulate on the inside of a scuba bottle by one of four methods. If a tank with a single hose regulator is allowed to become completely drained of air while in the water, and if the purge button is activated, the second stage will open and water will flow right into the tank. Obviously, a tank should never be allowed to be completely emptied of air. Secondly, when a tank is filled, a small amount of water may enter the tank valve if the tank is submerged prior to hooking up the filler attachment. Only a small amount of water will be injected, but over a period of several months it is enough to cause a powder-like rust to develop in the cylinder. Thirdly, if the filtering system on a compressor is inadequate, moisture in the compressed air is enough to begin a corrosion problem. And fourthly, if a tank is drained rapidly of air, moisture will condense on the inside of the tank. If the tank is to be emptied of air, other than by normal use, it should be emptied slowly enough to prevent the process of condensation.

Photographs by Author



In the past, some manufacturers attempted to line their tanks with an epoxy coating. This worked well in preventing corrosion, providing the entire inside of the cylinder was totally covered. However, if there was just a pin prick in the lining, moisture could concentrate in one spot and spread underneath the epoxy to be hidden from view when the tank was visually inspected. In many cases, this was sometimes worse than no coating at all.

Obviously with a little common sense, care and maintenance, steel tanks can and do give years of service. The estimated fatigue life of a steel diving cylinder is in excess of 100,000 air fills, providing the cylinder remains dry. To help maintain this longevity, AMF Swimaster recently introduced a one and a half ounce liner that can be inserted and removed at will. The "Lifeliner" is a contoured polyvinyl bag similar to the same type of material that is used to make bladders for inflatables. The chemical composition is different but they feel very much alike. The material is approved by the Food and Drug Administration for use in life support systems so there

is no danger of toxic or nauseous odors or gases when the material is under pressure. The liner is the same shape as the inside of a tank and will only fit the standard 71.2 cu. ft. steel cylinder. When properly installed, air never comes in contact with the cylinder walls — only with the liner.

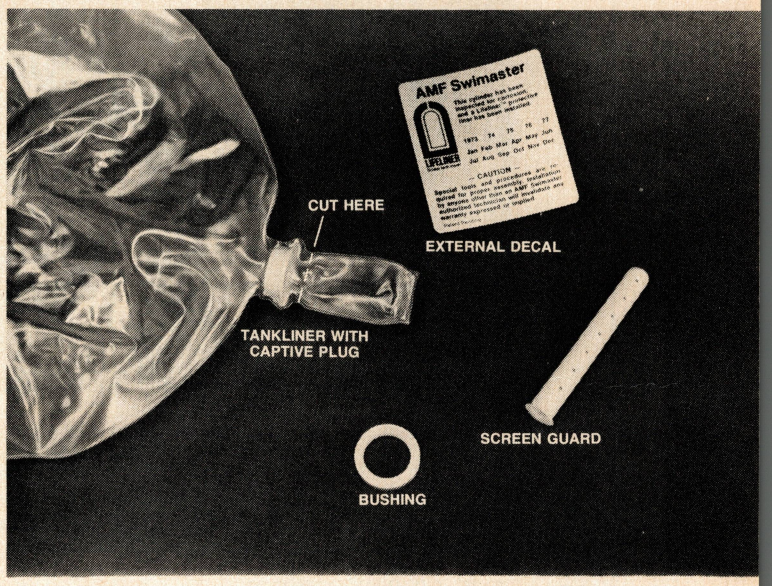
Because it is shaped to conform to the interior of the cylinder, the material experiences minimal tensile stress when properly installed. If the liner is not installed properly, a condition may be created that will cause the liner to rupture, and it might not be discovered until the next visual inspection. It's very important that only dealers who have had the proper training install Lifeliners. There are four parts to the actual Lifeliner that either go in or on your tank, and there are four basic tools to do the installation. First, it is very important that the interior of the tank is dry and clean. A scuba specialist will determine this with a cylinder inspection light, and if the cylinder needs cleaning he will inform you and do necessary cleaning. The next step is to clean the tank threads with a special pitch diameter 3/4-14 NPS thread tap. This is a critical step. If the threads are not cleaned, especially on a used cylinder, the threads on the polyethylene bushing will be damaged. The bushing provides a seat for a plug at the top of the tank liner to sit against. A bushing insertion tool is used to insert the bushing and there is a special procedure for doing this. If the tool is turned too much, the bushing will be screwed into the neck too far, perhaps even dropping right into the tank.

The Lifeliner is then prepared by cutting off the excess material at the top, about one-eighth inch above the captive plug. The liner is sealed against contaminants and therefore the seal should not be broken until just before installation. An air gun extension tool is then inserted into the Lifeliner, the Lifeliner wrapped in smooth lengthwise folds around the air gun and then inserted through the neck and bushing of the cylinder. The captive plug of the Lifeliner will then rest against the bushing, but it should not be seated until the liner has been slowly inflated, forcing all of the air between the liner and cylinder wall out of the cylinder. When all of the air is purged from between the liner and tank walls, and when the liner is seated smoothly, the air gun is withdrawn and the plug on the liner pushed securely into the bushing.

A plastic screen guard is then inserted to prevent the closing off of the air passage of the dip tube in the unlikely event of an improperly installed liner becoming wrapped around the bottom of the dip tube. The screen guard provides multiple air passages into the dip tube of the valve. The tank valve is then screwed in. If, when the cylinder valve is hand tightened, the valve fails to fully seat (leaving a gap between the top of the cylinder neck and the flange on the valve), there is a possibility that the plug is not fully seated against the bushing, or the bushing is not at the proper depth location. If this happens, the liner must be removed and the installation procedure should be repeated with a new liner.

A metallic Lifeliner decal is then dated and attached to the outside of the diving cylinder. A new Lifeliner is required at the time of each visual inspection since the removal technique often results in damage to the liner material. Lifeliners retail for $6.50, and Al Thompson charges a $3.00 installation fee which is probably comparable to most installation centers. Once the liner is properly installed, there is no way for air or water to get between the Lifeliner and cylinder wall, so a tank could theoretically be used until it just dies from fatigue and old age. Following are some simple rules to consider to get the most service out of your steel diving cylinder: 1) Have your tank hydrostatically tested and dated every five years. This is required by law and no air filling station should fill an outdated tank. 2) Have your tank visually inspected by a pro dive shop or scuba repair specialist at least once a year. If you dive in salt water and get air fills anywhere around salt air, such as from a charter boat, it might be a good idea to have your tank VIP'd twice a year. 3) Never drain your tank completely of air. Leave at least 200 psi in it at all times, even during storage. 4) Be sure that whoever fills your tank cracks the valve open prior to attaching the filler hose. This will blow out any water or dirt that has accumulated in the valve. 5) Be sure to flush the outside of your tank with fresh water after use in salt water, and use a tank boot that is easily removed or allows for the proper drying of the tank bottom. Some of the new tank boots on the market have large holes in the bottom and grip the tank with ridges allowing for a free flow of water between the sides of the cylinder and boot. 6) Store your scuba cylinder on end rather than on its side and prop it securely so that there is no danger of it falling over and damaging the valve. 7) Maintain the outside of your tank as faithfully as you do the rest of your gear. A cylinder that is rusty on the outside is just as dangerous as a cylinder that is rusty on the inside.

For ten bucks you can't go wrong in having a Lifeliner installed in your diving tank. A ten dollar investment is good insurance for your $125 scuba bottle.



Primary materials for Lifeliner system: the contoured polyvinyl bag with captive plug; the ring-like bushing which provides a seat for the plug; the plastic screen guard, and the inspection label.



Photograph by Paul Tzimoulis

Visual Inspection (VIP) is done with a cylinder inspection light, and it's the only way a diver can know if his tank is rust-free.

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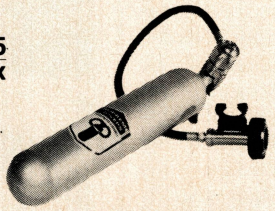
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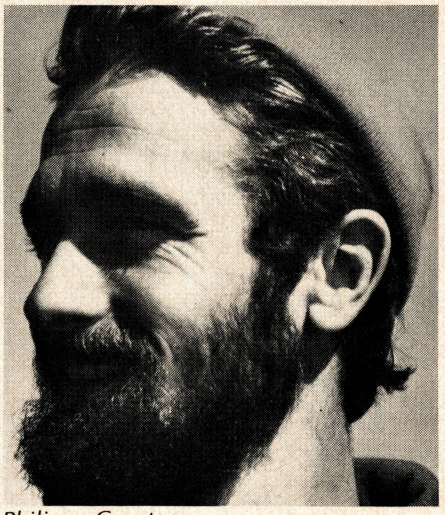
UNDERWATER '74

BOSTON, MASS.

The fall edition of Underwater '74 will be presented Saturday, September 21, by NAUI and the NDA (NAUI Diving Association). It will be a three part program, with a careers in oceanography program in the morning, an underwater symposium in the afternoon, and an underwater film festival in the evening.

The Conference on Marine Education, Careers and Summer Expeditions for High School Students, sponsored by the Explorers Club of New York, NAUI and Boston University, will start at 10 am. Richard Enright, coordinator of youth programs for the Explorers Club, will be special host for the Conference, which is free to high school students.

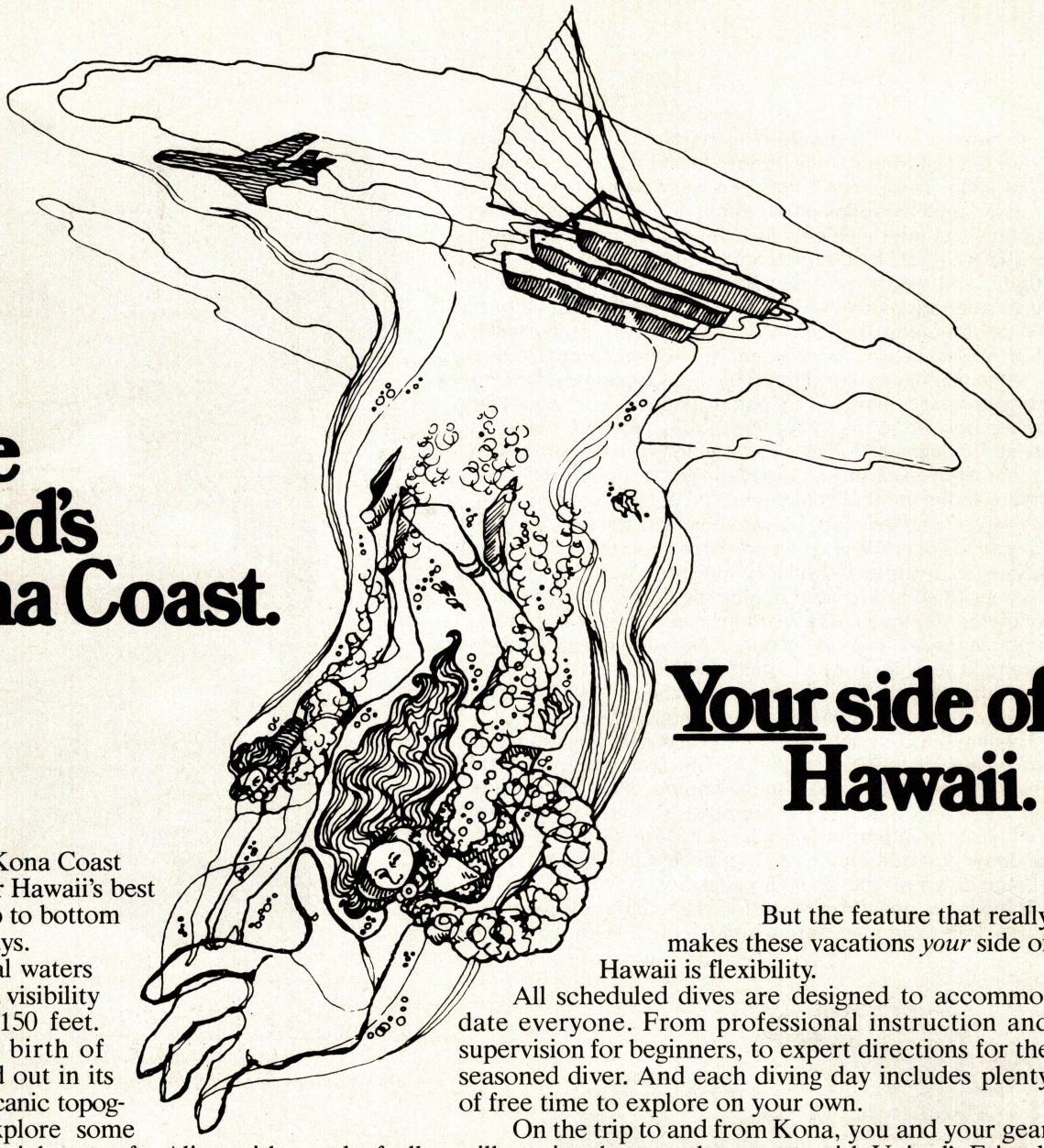
Beginning at 12 noon, the Underwater Symposium will present a series of lectures relative to Man in the Sea. Highlighting the fall edition of the Symposium will be two special offerings: "Search For the *Monitor*," the exciting recount of the most recent expedition to discover the Civil War metal-clad battleship; and "The SHAD Project" (Shallow Habitat Air Dives), the feasibility study centering around saturation air dives. On the same program, many of the speakers present during the spring Underwater Symposium will return to bring everyone up-to-date on their latest projects.



Philippe Cousteau

The Underwater Film Review, featuring *L'Aventure Cousteau*, will start at 8 pm at the John Hancock Hall in Boston. *L'Aventure Cousteau* is all new, all Cousteau, and will be presented by Tom Horton, vice president of Thalassa Inc., a Cousteau Group Company. In addition to *L'Aventure Cousteau*, master of ceremonies Fred Calhoun will present *All In A Day's Dive*, the Slide Gallery, and a premier short subject.

Tickets for the Underwater Symposium and the Underwater Film Review, which are $3.50 each, may be purchased at the door or in advance by contacting Fred Calhoun, Box 291, Back Bay Annex, Boston, Mass. 02117. Make checks payable to NAUI.



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kona surf

The purpose of this article is to report on the new Nikon 15mm lens and optical viewfinder for the Nikonos camera.

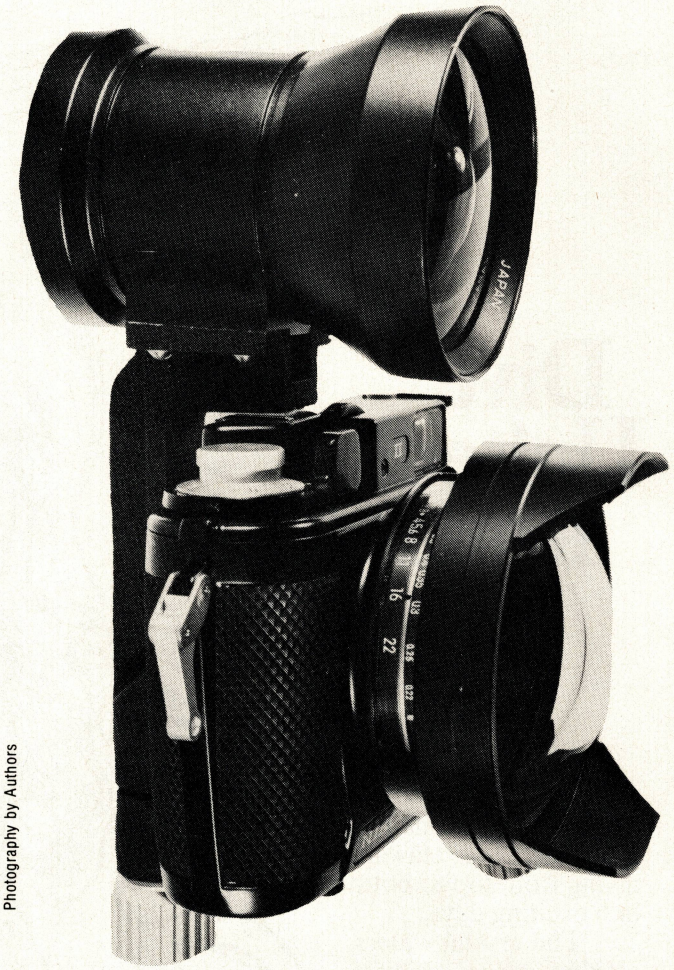
The 15mm Lens—The 15mm lens was designed exclusively for wide-angle Nikonos photography to a depth of 160 feet. The lens has nine elements in five groups, aperture settings from f2.8 to f22, focused distance settings from one foot to infinity, and yields a 94 degree picture angle. Because the image aberrations of the lens are corrected specifically for U/W photography, the 15mm lens can't be used above water.

The lens is secured to the standard Nikonos camera body in the same manner as the Nikonos 35 or 28 mm lenses. First, the lens is pressed gently into place with the focusing knob pointed upward to the top of the camera. Second, the lens is rotated 90 degrees clockwise to lock in place. When rotating the lens while installing or removing, pull it slightly away from camera so the guidepins on the lens will clear camera body.

Front and rear lens caps are provided with the lens. The front lens cap fits over the glass dome port and screws into threads located inside the lens hood. The inner, rear surface of this cap is rubber-lined to avoid scratching the dome when the cap is installed or removed. The rear lens cap attaches in a manner similar to the rear caps of the other Nikonos lenses and forms a watertight seal. To install, align the white dot on the rear lens cap with a guidepin on the lens, press the cap into place and turn clockwise. To remove, reverse this procedure.

The lens hood is cut back at the left and right sides and forms two "visors" at the top and bottom. The open areas prevent the lens hood from showing up in the corners of the picture area, and allow space for the photographer's fingers to screw the front lens cap into or out of place. The visors serve to protect the dome port from bumps and scratches, and the lens can be set face down on the visors if necessary.

The ease of operation of the focus and aperture controls is greatly improved over the previous lenses. With the camera held in the right hand, the focus control knob is in the familiar position at the photographer's left side of the lens, but the aperture control has been moved from the right side to the lower left, just below the focus control knob. Not only can both focus and exposure be set with the left hand, but both knobs are large and easy to grasp.

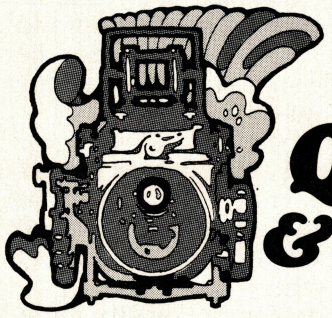


Photography by Authors

Side view of the Nikonos II camera, 15mm wide-angle lens, and optical viewfinder. Scales for aperture, focus and depth of field are inscribed under curved port covering.

The scales for reading aperture, focused distance and depth of field are located under a curved port at the upper right of the base of the lens mount. Both aperture and focus settings are aligned with a single black dot on the scale. Moving indicators show depth of field. By merely tilting the camera back a few degrees, and looking downward to the curved port, the settings for aperture, focus and depth of field can all be seen in one glance. The camera need not be pointed back at the photographer as with the other Nikonos lenses.

Because of the extraordinary depth of field with this wide-angle lens, we usually preset focused distance for the kind of wide-angle photography planned—close-up or medium to long distance—and usually don't change the focus underwater. For example, with an aperture of f5.6 and a focused distance of three feet, the depth of field scale shows depth of field from slightly less than two feet to ten feet. This covers the



UNDERWATER PHOTOGRAPHY

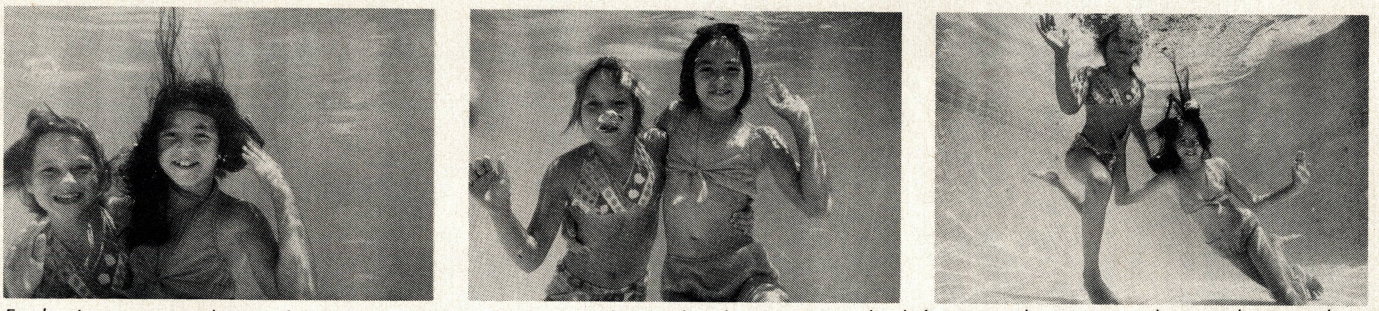
Quick & Easy

PART XLV

PRODUCT REPORT
The Nikonos 15mm Wide-Angle Lens



By Jim and Cathy Church



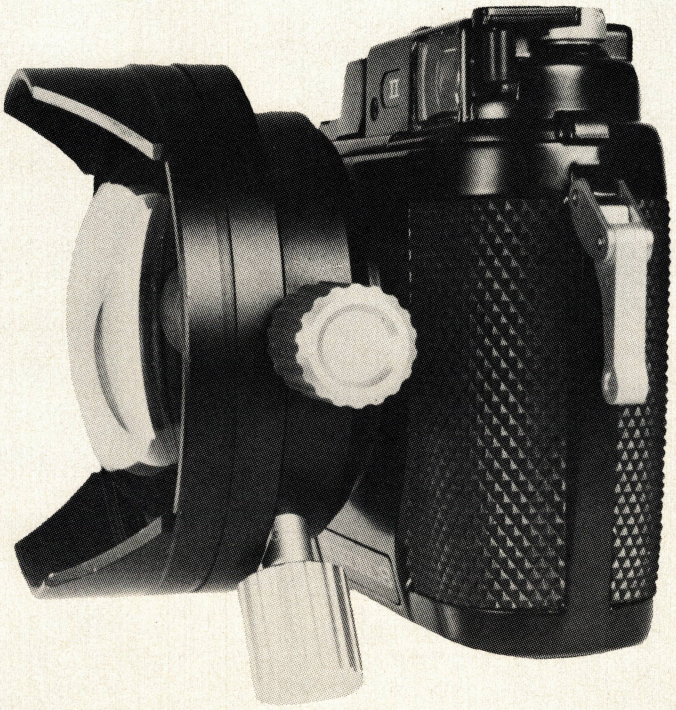
Each picture was taken at four measured feet illustrating the angle of view. From the left, 35mm lens, 28mm lens and 15mm lens.

majority of our medium and long distance shots. Even at f2.8 and a focused distance of five feet, depth of field extends from about three feet to ten feet. For close-up work, an aperture of f22 and a focused distance of one foot will yield a depth of field from about six inches to five feet.

The Optical Viewfinder—The three-element optical viewfinder is masked to yield a rectangular field of view approximating 90 percent of the picture area. This 90 percent ratio helps insure that subjects shown near the edge of the viewing field will not be cut off at the edge of the picture area. The viewfinder is parallax correct for an apparent camera-to-subject distance of five feet. At close-up distances of about two feet or less, the viewfinder should be aimed three to four inches above the center of the subject to adjust for parallax.

Because the optics were corrected for underwater use, the viewfinder produces blurry images in air. Underwater, however, it produces sharp images that are easy to see even in dim light. These images can be "focused" for the photographer's eye by moving the viewfinder slightly closer or further away from the eye. We found the optimum eye-to-viewfinder distance to be about three to four inches, which allows adequate clearance for a face mask.

Nikonos II with 15mm lens in place. The ease of operation of focus and aperture controls is greatly improved over previous lenses. Both knobs are large and easy to grasp.



The viewfinder is attached to the camera at two places. First, a mount at its base slides into the accessory shoe on top of the camera. Second, a "C-clamp" bracket extends downward to the bottom of the camera body. A rubber-padded clamp fits around the film advance counter window and is held in place by a hand-tightened, threaded knob.

Adding Accessories—The standard Nikonos B.C. (battery-capacitor) flash gun has a beam angle of 64 degrees, which is inadequate to illuminate the entire 94 degree picture angle of the 15mm lens. While we were unable to test this particular flash unit with the lens we feel that just about the entire 94 degrees could be covered by holding the flash unit back behind the camera a foot or two. Tests would have to be conducted to confirm this.

For improved ease of handling when a strobe and/or exposure meter are added to the system, we recommend adding a baseplate with handle and thumb-release to the system. The Subsea Products Nikonos bracket with optional handle and thumb-release, or the Oceanic Products Pro-grip, are typical choices. The "C-clamp" locking mechanism of the viewfinder will clear the extra width of these baseplates. With wider baseplates, simply slide the viewfinder back a fraction of an inch for added clearance.

If accessories are added, the photographer may have to vary his method of operating controls and viewing the scales. With the Subsea or Oceanic Products bracket systems described (with or without strobe), try this procedure: First, preset focus as already mentioned. Second, use the left hand to reach the aperture control knob from underneath the camera and baseplate. Third, look downward between the viewfinder and handle-mounted exposure meter to see the f-number aligned with the screwhead across from the black dot on the scale. This bright screwhead is easily seen against the dark lens mount even in dim light, and the click-stop aperture changes can be felt as well as seen. Within one or two dives the procedure becomes second nature.

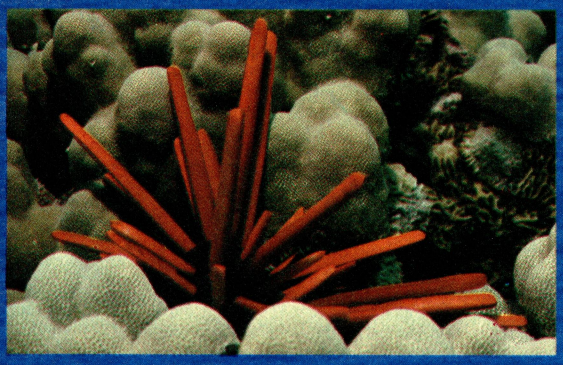
Conclusion—The Nikon 15mm wide-angle lens and optical viewfinder, priced at $1,015.00 and $269.50 respectively, are precision instruments designed for precise optical results. At this writing, we know of no other 35mm camera system which combine the optical qualities of this wide-angle lens with the compactness of a Nikonos camera system. The lens and viewfinder are distributed by Ehrenreich Photo-Optical Industries, Inc. (623 Stewart Avenue, Garden City, NY 11503) to franchised Nikon dealers, and by U.S. Divers (3323 West Warner Avenue, Santa Ana, CA 92702) to dive shops.

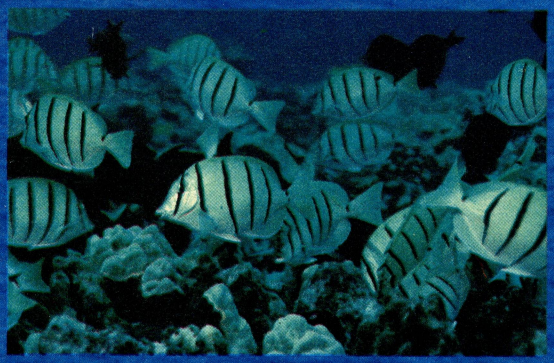
Fair Wind AT KONA

By Paul Tzimoulis

Situated on the western side of the big island of Hawaii, the Kona Coast has been traditionally regarded as one of the finest diving areas in the Hawaiian Islands. The waters here are a deep crystal blue, with visibility averaging 150 feet and water temperatures ranging from 78° to 80°. Surface conditions are generally calm, almost placid, for Kona is protected from the Pacific trade winds by three high volcano peaks. The undersea terrain is a fascinating kaleidoscope of coral lined caves, deeply cut ravines, sculptured archways, lava tunnels and a steeply descending slope which often leads to an underwater fairyland of black coral. The lure of Kona's undersea paradise attracts thousands of divers annually from the mainland, thus making it the best known and most popular dive spot in the Pacific.

Now, another element has been added to the Kona scene, making it an even more attractive vacation spot for the traveling diver. Kona now offers a large, well-equipped diving cruise boat, operating daily dive trips to some of the finest spots along the coast. The vessel is called the *Fair Wind.* It is a 52 foot long sailing Trimaran, powered by a GMC-453 diesel engine. She can accommodate up to 25 divers, carries up to 50 scuba tanks and cruises at 10 knots. She is completely crewed by scuba divers, including a certified N.A.U.I. instructor. In addition to being one of the most beautiful commercial vessels designed, the *Fair Wind* is unquestionably the finest diving cruise boat now operating in Hawaii.









Diving on the Kona Coast is enhanced by the Fair Wind, a vessel offering trips to paradises where flora and fauna abound.

Photography by Author


Fair Wind

Perhaps the most exciting news in the last few months has been the development of a new dive tour package involving the use of this fine dive boat on a year-round program. United Airlines has gotten together with See and Sea Travel Service, the Kona Surf Hotel and Fair Wind Charters to offer a one week diving package with departures from the mainland every Thursday morning. Attractively priced at $495, this exciting tour package includes five days of diving, a night dive, two tanks of air per day, room accommodations for six nights at the Kona Surf Hotel, a cocktail party, continental breakfast on the diving days and a sunset dinner cruise.

Designed by travel entrepreneurs Dewey Bergman and Carl Roessler, the new Kona diving holiday is arranged in such a way as to provide the maximum diving opportunities at the very best part of the day, still leaving plenty of time for other leisure activities such as sight-seeing, shopping, tennis, sailing, etc. It is basically a fun diving week, geared to please both the hard-core diving enthusiast and the family vacation group interested in all types of resort activities. Perhaps the best way to explain what Kona has to offer the diver is simply to describe the type of diving activities which will be included in this United Airline/See and Sea tour package.

The first day of the tour begins every Thursday morning with a five hour flight from either Los Angeles or San Francisco to Honolulu aboard United Airline's roomy 747 Jumbo Jets. To help pass the time, a movie is generally shown aboard this flight, and the cocktail lounge is open for the majority of the flight. At Honolulu International Airport there is a quick change of baggage and passengers to Aloha Airline's 737 interisland jet flight from Oahu to the big island of Hawaii. The trip takes about 35 minutes. Landing at Kona's $19,000,000 airport is usually a surprise for those who haven't been there before. This modern airport facility has literally been chiseled out of hard lava rock and your arrival appears a little bit like landing on the moon.

At the Kona Airport you would be met by a staff of the Fair Wind Charter Service, ready and waiting with a couple of micro bus vans for transferral of the luggage and diving gear. The trip from the airport to the hotel takes about 30 minutes and includes a quick tour through Kailua-Kona, the major town on the Kona Coast. By 4:00 pm of the same day you would be checking in at the fabulous Kona Surf Hotel, one of the most beautiful and luxurious hotels on the Kona Coast. Built on top of a lava cliff overlooking the ocean, this 550 room hotel facility is almost a small city in itself. The hotel complex includes a beautiful golf course, tennis courts, a large salt-water swimming pool, a gourmet restaurant, a night club and a half-dozen or so clothing and jewelry shops. It is a first class hotel facility, offering lavish rooms and excellent food.

By the time your luggage is unpacked it is time for a welcome cocktail party at the Fair Wind facilities. This would be your opportunity to get a preview peek of the dive boat and a chance to personally meet the people who run the *Fair Wind*. Mike Dant and his lovely wife, Jan, are a charming California couple who have found the good life in Kona. Mike personally designed and built the *Fair Wind*, then sailed it from California to Hawaii. You will also meet the three diving skippers of the *Fair Wind*, Nick Berg, Bob Brackbill, and Bill Cucarro. All three are expert divers, very fine boat skippers and cordial hosts. Having dived and sailed the Kona Coast on a daily basis for several years, these men know practically every cave and reef from Keauhou Bay to Captain Cook's Monument.

The *Fair Wind* and its diving headquarters are located at Kona Bay, practically next door to the Kona Surf Hotel. There is no big hassle with transportation and you can practically walk from the hotel lobby to the boat pier if you desire to do so. This close proximity between the hotel and the dive boat makes it easy and convenient to get off to an early start. Most of the week's diving starts very early in the morning, in order to take full advantage of Kona's daily weather cycle.



Diver Andy Jones handfeeds a large blue crevally in the bay at Captain Cook's Monument, where fish are exceptionally friendly.

Just about every day in Kona begins with a sparkling sunrise and clear blue skies. It is not uncommon for Kona residents to arise at 5:30 to 6:00 and be off to work by 7:00. The clear blue skies continue from early morn to approximately noon when large cloud formations begin to appear along the ridge crest of Mauna Loa volcano. As the island's black lava fields are heated up by the sun's rays, strong warm air currents draw large cloud formations to the coastal area, thus making the afternoon cloudy and overcast. Because of this highly predictable weather cycle, the best diving conditions are between 7:00 and noon when the sun is bright and the sea is calm.

The first dive site is generally KEALAKEKUA BAY, the historical landing site of the famed Pacific explorer Captain Cook. A tall white obelisk monument now marks the location. This beautiful little bay is located about six miles south of the Kona Surf Hotel and is perhaps the most protected dive site on the entire Kona Coast. It was once the crater of an ancient volcano, partially caved into the sea. The shoreline is a 500 foot high bluff of lava rock and the water is exceptionally deep.







The 50 foot trimaran Fair Wind is capable of carrying 25 divers, 50 scuba tanks, and cruising at a speed of 10 knots. The vessel operates on a daily basis from beautiful Keauhou Bay, which is about 20 miles north of Hawaii's 180 acre City of Refuge National Park.

The *Fair Wind* generally anchors just under the high cliff in a depth of 20 to 30 feet of water, with the shoreline barely a stone's throw distance. There you find the water exceptionally clear with 100 foot visibility quite common. The shallows are covered with a rich carpet of corals and marine life. One of the most impressive sites is the vast number of red pencil sea urchins which abound in this area. There is hardly a coral head or crevice that does not have two or three of these colorful creatures in residence.

The shallows are filled with beautiful tropical fish of every size, color and description. They are fascinating to watch and make marvelous subjects for the underwater photographer. You also find the fish exceptionally friendly and totally unafraid of the scuba diver's approach as they are fed daily by divers and glass boat operators. You can hand-feed almost every variety of fish from the yellow trumpetfish to the small spotted moray eels. This bay area has been proclaimed a Hawaiian State Park, thus protecting and preserving the fish life, corals and other marine life which resides there. It is an excellent place for your first check-out dive and familiarization with Hawaii's unique undersea environment.

The second dive of the day might possibly be at THE ARCHES, located a little to the north and closer to the hotel. This particular area has been named after the eight or nine beautifully sculptured lava archways which are to be found in 20 to 40 feet of water. These magnificent formations were caused by the rapid cooling of molten lava which flowed into the sea more than a century ago. Some of the archways are quite large, measuring 30 to 40 feet in diameter. One can often find a small community of tropical fish, small morays, and other creatures living in the shadow of these formations. They provide an unusual opportunity for underwater photography and represent a breathtaking example of nature's marvelous handiwork. A series of lava caves can also be explored in this area. They are generally found in deeper water ranging from 50 to 60 feet. The terrain in this area is solidly packed with small live corals and often frequented by schools of tangs.

By noontime you are back at the *Fair Wind* dock ready to spend a leisurely afternoon exploring your new-found surroundings. Since it is your first full day on the Kona Coast, you may want to take a little time investigating the activities and

(Continued on Page 34)

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Scuba Instructor Certification

August 17-19, September 14-16, 28-30
YMCA Scuba Instructor Certification Institute, Chattanooga, Tenn. (Contact: Bart Jones, 2831 Birchwood Way, S.W. Marietta, Ga. 30060)

September 6-14
NAUI Instructor Qualification and Training Course, Monterey, Calif. (Contact: NAUI Mid-Pacific Branch, 816 Columbia St., Santa Cruz, Calif. 95060)

September 7-8, 29-30, October 11-13
YMCA Scuba Instructor Certification Institute, Passaic, N.J. (Contact: John Geary, 1007 Bellair Ave., Fairlawn, N.J.)

September 7-14
NAUI Instructor Qualification and Training Course, Palm Beach Shores, Fla. (Contact: NAUI South Atlantic Branch, P.O. Box 10356, Riviera Beach, Fla.)

September 7-8/29-30/Oct. 11-13
YMCA Instructor Institute, New Jersey. (Contact: John J. Geary, 10-07 Bellair Ave., Fairlawn, N.J. 07410)

September 21-22, October 12-13, November 2-3
YMCA Scuba Instructor Certification Institute, Dallas, Tex. (Contact: Pat Ryan, 4332 Northaven Rd., Dallas, Tex.)

September 27-28, October 18-19, November 22-23
YMCA Scuba Instructor Certification Institute, Indianapolis, Ind. (Contact: Tom Haver, 6001 Compton, Indianapolis, Ind. 46220)

September 28-29, October 19-20, November 23-24
YMCA Scuba Instructor Certification Institute, Indianapolis, Ind. (Contact: Tom Haver, 6001 Compton, Indianapolis, Ind. 46220)

September 30
PADI Instructor Certification Course, Seattle, Wash. (Contact: John Manlove, Divers Institute of Technology, Dept. S, P.O. Box 70312, Seattle, Wash.)

September 30-October 5
PADI Instructor Training Course, Seattle, Wash. (Contact: Course Director, P.O. Box 70312, Seattle, Wash. 98107)

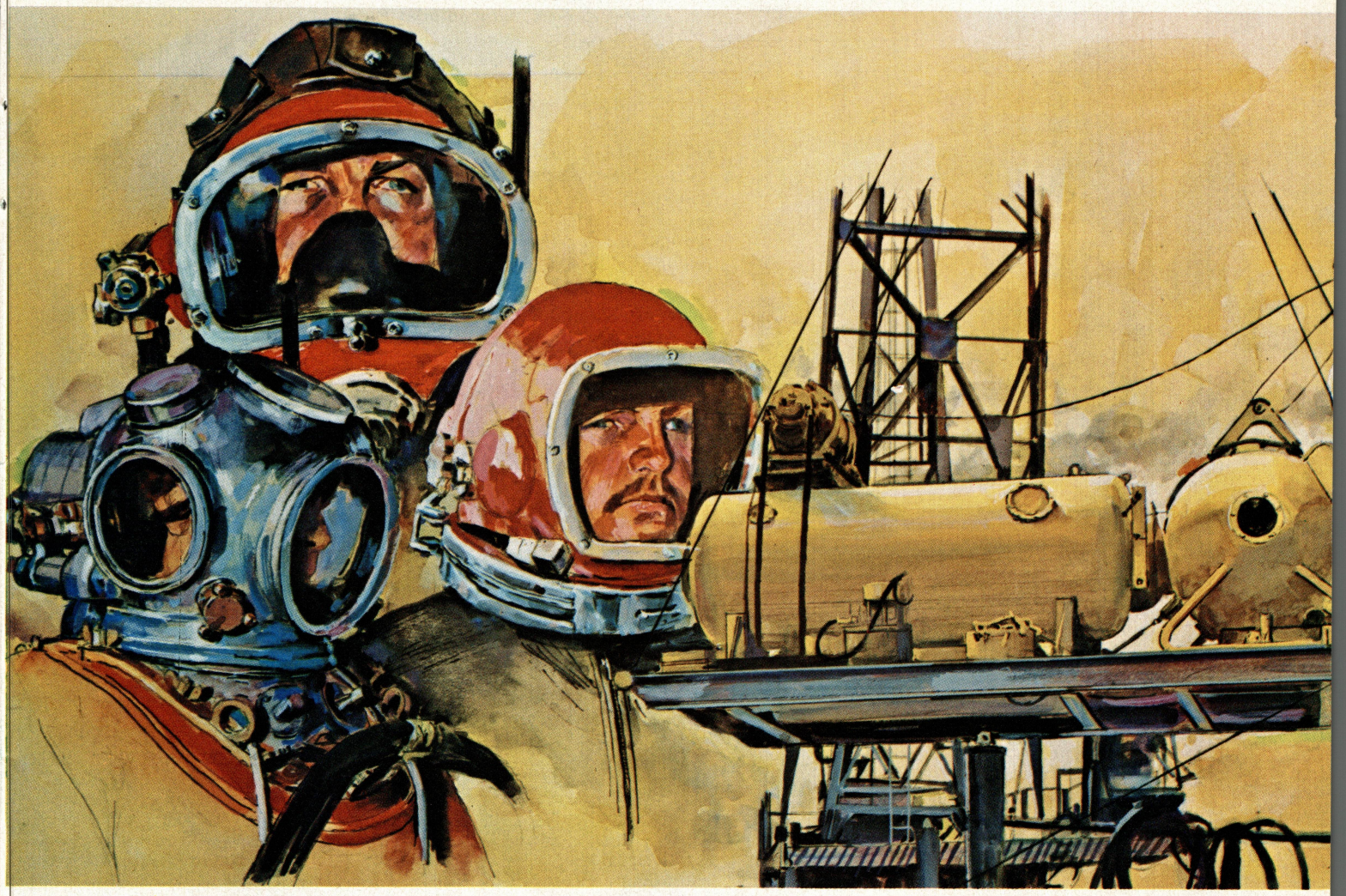
September 30-December 6
NASDS College, San Diego. (Contact: NASDS Educational Division, 1214 Rosecrans, San Diego, Calif. 92106)

October
YMCA Instructor Institute, Albany and northeast region. (Contact: Walter Hornberger, 7161 Spire Falls Rd., Gansevort, N.Y. 12831)

October 7
Professional Diving Instructor Course, Monterey, Calif. (Contact: Ed Brawley, 598 Foam St., Monterey, Calif. 93940)

December 7-15
YMCA Instructor Institute, Cozumel, Mexico. (Contact: Jan McGinnis, 10010 Memorial #1413, Houston, Tex. 72024)

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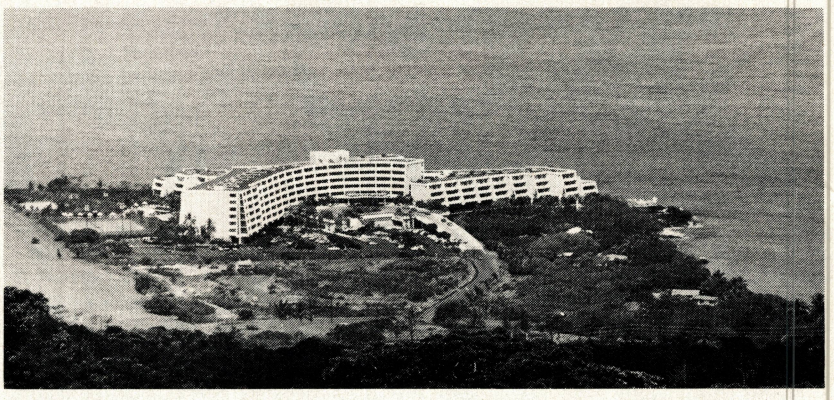
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photography by Author

(Continued from Page 31)

Helen and Esty Stowell are a couple that took advantage of See and Sea Travel's Kona Diving Holiday. The package is in cooperation with United Airlines, Kona Surf Hotel and Fair Wind Charters, and includes five days of diving, a night dive, two tanks of air per day, room accommodations for six nights, a cocktail party, continental breakfast on diving days and a sunset dinner cruise.



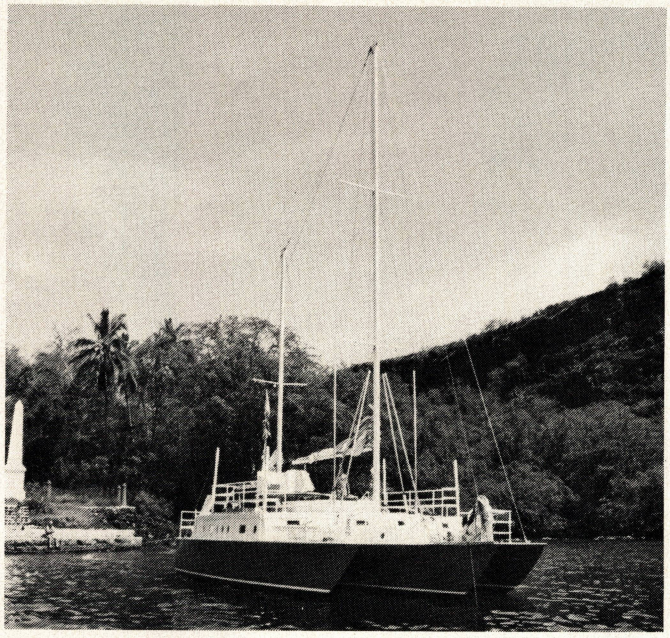




facilities at the Kona Surf Hotel. They have an excellent golf course which is available to the guests at a nominal cost. There are also tennis courts, shuffleboard and a very beautiful swimming pool which overlooks Keauhou Bay. If you are a little more athletically inclined, you may want to try body surfing at Magic Sands Beach, just a couple of miles down the road from the hotel. Incidentally, the hotel offers a very fine buffet lunch at their open air dining area.

Your second dive day is a reverse of the first in that you have the morning off and depart the *Fair Wind* at 3:00 pm for an afternoon dive and a night dive. In view of the free time available, a half day trip to the historical City Of Refuge might be well in order. Located 22 miles south of the hotel, this national historical park provides an excellent insight into the old Hawaiian culture and religious beliefs. Once the residence of Hawaiian kings and priests, this sacred city was the refuge of law-breakers, defeated warriors and elders too weak to do battle. A great stone wall, measuring 10 feet high, 17 feet wide and extending for more than 600 feet separated these holy grounds from the outside world. The exhibit includes fine examples of ancient Hawaiian handcraft including outrigger canoes, thatched roof buildings and magnificent wooden carvings which represent the various gods.

Upon departing from the dock, the *Fair Wind* generally heads out to a nearby dive site known as RED HILL, located just a mile or two south of the hotel. This area was also once part of an ancient volcanic cindercone. The bottom terrain there is entirely different from other areas with large flat lava mesas coming to within 40 feet of the surface. They are separated by sheer wall canyons which drop off to 80 or 90 feet. Small caves or pukas in the side walls of the canyon, offer an excellent opportunity to view some of the interesting fish of this area. Quite a few surgeonfish can be seen in this area and quite often some of the rare varieties of tropical fish. It is not unusual to find a saddleback butterfly or a bandit angelfish casually cruising among the corals.



The night dive is generally conducted at KEALAKEKUA BAY since the diving guests have become familiar with this reef area the day before. Also, the water is generally glossy calm in this bay and ideal for night diving activities. It is interesting to note the fantastic change in this reef between daytime and night. A number of different creatures which were not seen during daytime hours now come out onto the top of the reef. These include lobsters, red shrimp and several of the more timid species of fish.

Another fascinating aspect of the night dive is the change of coloration in many species of the Hawaiian fish population. For example the moorish idol, which is generally yellow, black and white during the day, changes to a brown and white pattern at night. The yellow and white goatfish becomes an iridescent pink during the starlight hours. Most of the fish action is found in the shallows at depths ranging from 7 to 20 feet. The boat is generally back at the dock by 10:00 pm, thus allowing sufficient time for rest before the next day's diving.

The third day of diving begins just as the first with an early 7:00 am departure and a continental breakfast aboard the boat. The first dive of the day is generally at LAVA RIDGE COVE, located near the Red Hill area. There you'll find a series of long narrow lava ridges close to shore, another example of the unique manner in which hot flowing lava can form exotic structures when suddenly quenched by sea water. The alleyways between the ridges range from 10 to 20 feet in depth and are filled with thousands of fish. The species are mixed and often include surgeonfish, yellow tang, achilles tang and convict tang. This area is also rich with a very beautiful species of butterflyfish known as the tear drop butterfly. The area is ideal for the fish photographer as the cameraman can move right in amongst the thousands of milling fish — thus becoming part of the giant natural aquarium.

For the second dive of the day you might perhaps go to KEAUHOU CLIFF. Large chunks of lava shaped like giant blocks of granite can be found close to shore. General diving depths range from 25 to 50 feet with a very interesting and uneven terrain. This area is well known for its abundance of parrotfish, dark finned damsels and squirrelfish. You may also encounter a number of four-spot butterflyfish. Coral formations are often separated by rivers of black lava sand which meander along the bottom. You'll also find several large lava caves right up against the shoreline.

The *Fair Wind* is generally back at the dock by noon, thus affording an afternoon for possible sightseeing and shopping in the nearby village of Kailua-Kona. There you will find a marvelous array of small gift shops and curio stores affording a wide variety of Hawaiian handicrafts. Items range from black coral jewelry to Hawaiian pattern prints for the dressmaker.

With an early departure aboard the *Fair Wind*, the fourth day of diving begins at a very unique dive site known as THE TUBES. This particular area is honeycombed with long lava tunnels, large enough to permit diver exploration. Although most of the tunnels permit sufficient sunlight for navigation, a diver's light is advantageous for illuminating the colorful creatures which often inhabit these tunnels. Most of them are filled with a variety of fish, including big-eyes, squirrelfish and tang. The depth ranges from 20 to 40 feet and most of the tubes are 20 to 30 feet long. However, there is one exceptionally long tube, measuring 125 feet. It is about 12 feet wide and four to seven feet high. Visiting divers often find large red crayfish and tiger cowries living in this particular tunnel.

The second dive of the day is at KAUMOO BAY where divers can explore a series of lava arches and deep ravines. This spot is well known for Hawaiian lobster and Kona crabs. There is also a shallow coral reef swarming with marine tropicals of almost every species. Again, the *Fair Wind* is back at the dock by noon, thus allowing you an entire free afternoon and evening. If you are interested in a nice drive and a wonderful buffet lunch, you might consider a trip to the Kona Village Resort. This beautiful Polynesian style resort is located on a secluded beach north of the Kona Airport. For the price of $6.50 you will be treated to one of the finest buffet lunch meals available anywhere on the Big Island. There is a great variety of dishes included — both mainland and Polynesian cuisine. Kona Village also has a very lovely beach for sunbathing and swimming. Buffet reservations must be made in advance.

The last day of diving begins with an early morning dive at KEALAKEKUA LIGHTHOUSE just around the point from the Captain Cook Monument. The reef comes directly off the point at a depth of 30 feet and promptly drops off to a depth of 200 feet at a 70 degree slope. There is an incredible amount of marine life in this area, often described as a solid wall of fish. Species include great schools of yellow tang, big triggerfish, unicornfish and many yellow trumpetfish. It is also an excellent area for photographing several small reef white-tipped sharks which frequent nearby keys. This particular site is considered one of the most exhilarating dives on the Kona Coast.

Just about the time you have calmed down from the thrill of the first dive, it's time to pay a visit to DRIFTWOOD TUBE, another of Kona's unique lava tunnel formations. This particular lava tube is six feet in diameter and 20 feet long. It begins at a depth of 40 feet and spirals downward and to the left coming out on a sheer wall at 75 feet. Visibility in this area is usually excellent and the trip through Driftwood Tube is a special kind of thrill never before experienced.

The afternoon provides a time for packing up your diving gear and luggage and perhaps a little last minute shopping and sightseeing. You may want to celebrate your last evening at Kona at the elegant James Makee Dining Room located in the hotel complex. There is also after dinner dancing at the new Poi Pounder club or adjacent Puka bar.

The next morning is an early hotel check-out and ride to the airport with a mid-morning flight from Kona to Honolulu. This is followed by a quick transfer and noon flight back to the mainland. And in your mind you will probably be thinking, "I'll be back soon," for the Kona Coast has a way of capturing the diver's heart.

Should you desire additional information, brochures or air fare prices, contact your local United Airlines sales office or write to Dewey Bergman, See & Sea Travel Service, Suite 340 Wharfside, 680 Beach Street, San Francisco, California 94109. If your dive club is interested in bringing a full group over to Kona, you might want to write to Mike Dent, Fair Wind Charters, Box "J", Keahou Bay, Kona, Hawaii 96740.



Photography by Paul Humann/Text



Ocean Gallery

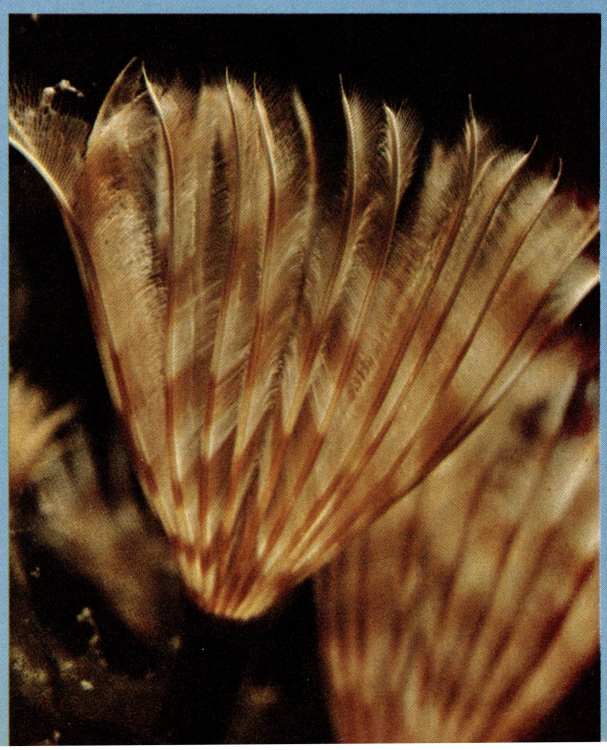
The Fanworm

The fanworm is one of the most delicate and beautiful creatures a diver could hope to photograph in the sea, as the long thin filaments which give the fanworm its name come in every color of the rainbow. But the fanworm is difficult to photograph because it can withdraw its filaments with lightning speed. The fanworm doesn't have eyes, but the slightest vibration or even a small change in light will activate simple pressure sensitive, or other light sensitive, cells which are scattered throughout the filaments serving solely for the detection of predators, such as a passing fish.

The fanworm, a type of marine bristle worm related to two families, the Serpulidae and the Sabellidae, can react up to 100 times faster than a human. This reaction is due to its well developed set of muscles linked to a fantastic nervous system which is, in turn, linked to the pressure and light sensitive cells in the filaments. The speed of the reaction is determined by the thickness of the worm's nerve: worms with small nerves have a slower reaction than worms with thick nerves.

The fanworm uses its filaments for the gathering of food, oxygen and building materials. The filaments, in fan shape, sway gently back and forth with the sea's surge and currents, filtering small particles from the water. These particles are then swept toward the worm's mouth by tiny cilia on the filaments. At the mouth, the particles are sorted into three categories: the large are discarded, the medium are ingested into the digestive system, and the small are mixed with saliva and used to make the tube home of the worm.

Divers interested in the fanworm will not have much trouble locating one, as the fanworm makes its home in beds of seaweed, on rocks, shells, and among coral. Fanworms are found in almost all oceans and where one is found others may be found nearby.



by Steve Roberson



An U/W phone booth let divers talk as they salvaged a Roman wreck at Yassi Ada.

Photograph Courtesy U. of Pennsylvania Museum

Underwater Archaeology

the state of the Art

By Robert F. Marx

Over seventy percent of the earth's surface, one hundred and ninety seven million square miles, is covered by water. Yet man has only recently begun to explore the depths of his watery planet to discover countless traces of the past. Like the artifacts painstakingly unearthed from land sites, those found underwater can furnish important clues to help archaeologists and historians piece together a more complete reconstruction of man's past history.

Underwater archaeology ranges from the excavation of shipwrecks to the excavation of submerged cities, towns, ports and ceremonial wells or cenotes, and includes sites once occupied by prehistoric man. Any site bearing traces of man's history, whether in a shallow pond or the ocean depths, is of significance and any diver coming upon such a site is either a potential archaeologist or a potential destroyer. The choice may depend on the training and knowledge available to him.

The future of underwater archaeology hinges, in part, on encouraging the motivated amateur diver to acquire the basic tools necessary for archaeological research and excavation. The funds available for training professionals are severely limited and so it is the amateur diver, for whom underwater archaeology is an avocation, who must fill the void.

There is a great deal of work to be done in underwater archaeology, and in many areas there is a particular urgency to excavate underwater sites which are threatened with destruction by the ravages of man and nature. But at the present time there are fewer than 50 professional underwater archaeologists in the world, and there are few incentives to lure young people into the field full time. Until a few years ago it was literally impossible to earn a college degree in underwater archaeology. Now, only the University of Pennsylvania offers such a degree for post-graduate students who already hold a degree in land archaeology or a related field. During the past spring the University of California at San Diego became the first school to offer undergraduate courses in this field.

Most school-affiliated underwater archaeologists find themselves limited to a relatively few months of field work a year because of their academic responsibilities. After more than ten years of chafing under such limitations, Dr.

George Bass and Michael Katzev gave up well paid teaching posts to work full time doing actual marine archaeological projects. They founded the American Institute of Nautical Archaeology based on Cyprus, and during 1973, their first year of work, they explored the sites of some 20 ancient shipwrecks which had first been discovered by sponge divers.

Hopefully other professionals may follow their lead and have a chance to do some actual work in the field. Few land archaeologists have shown interest in learning to dive, yet it is these same persons who categorically state that underwater excavations, when they should be undertaken at all, should only be attempted by professional archaeologists. Actually there are two schools of thought. Although most land archaeologists subscribe to the above, those who have actually done work on underwater sites generally feel important work can be accomplished by anyone who is intelligent, a competent diver and interested enough to learn the basics.

The techniques of underwater archaeology are relatively uncomplicated and can be mastered with practice. Expertise in archaeology is not essential in the preliminary phases of searching for and locating sites, although preparatory reading and research, and a certain familiarity with excavation on land sites, is certainly useful. As proof of the contribution of non-professionals, one has only to realize that every single important underwater site which has been excavated was actually discovered by amateurs. Furthermore, they have designed and built most of the equipment used in underwater archaeology.

Public interest in archaeology has grown so that the dividing line separating the trained paid archaeologist from the serious disciplined amateur is narrowing. The media informs us of the latest techniques and finds with the result that more amateurs are eager to get involved. More than three quarters of the members of local, state and regional archaeological societies are amateurs — so called because they hold no degree in archaeology. Actually they undertake more field work, laboratory research, and publish more reports of findings than do the limited number of professionals. Many non-academics have special qualities to contribute such as diving, use of special equipment, surveying, drafting or photography which they have acquired in the pursuit of their vocation.

There are close to three million skin divers in the United States, and about a million in Europe. During the past 20 years some of them have done more damage to underwater sites than the combined forces of nature during the past 3000 years. The first culprits were commercial salvage divers. During the Second World War, when there was a great demand for scrap metal, they combed lakes, rivers and oceans and recovered, among other more modern scrap, thousands of old anchors, cannon and other items from sunken ships. Most probably they were unaware that they were often making it impossible to refind a historical wreck site once they had removed the only clues which could be detected by special equipment, or indeed, the only clues which could be seen in the case of ships with iron or lead ingots for ballast rather than stones.

The havoc wreaked by souvenir collectors and treasure hunters is similar. The weekend diver who simply picks up a cannonball or a bronze fitting from a wreck and carries it home to decorate his living room perhaps doesn't realize he may be removing a valuable clue to the location and identity of a site. The most startling fact, however, is that for lack of knowledge of scientific methods of preservation, the majority of items divers loot from sites have been allowed to deteriorate or actually disintegrate. It is a sad sight to see a once spendid iron cannon rapidly corroding to dust in front of a restaurant or dive shop.

Professional treasure hunters often inflict damage on a far greater scale since they are not content with removing an artifact from the surface but dig down and destroy objects buried in coral, sand or mud. Dynamite and huge dredging devices are generally their standard excavation tools in their search for precious metals, and these tools can demolish an entire site including the less intrinsically valuable artifacts such as glassware and ceramics. It is hoped that the souvenir collector and the treasure hunter will change their approach if given the opportunity to participate in the kind of archaeological excavation which not only yields treasure and artifacts, but enhances their value by establishing their place in the context of history.

The governments of countries where indiscriminate destruction of underwater sites has been allowed must bear part of the blame. Until recently there was little official concern regarding archaeological sites in general, and virtually no laws protecting underwater sites. By now most of the European countries have introduced legislation designed to protect such areas, and most of the nations of the Western Hemisphere have statutes stipulating that the country is entitled to a share of what a diver finds — but few of them have laws protecting the sites.

Mexico was the first country in the Western Hemisphere to prohibit the excavation of underwater sites save under official supervision and by accepted methods. In 1958 CEDAM was founded in Mexico and this semi-official organization is in charge of directing all un-

(Continued on Page 78)



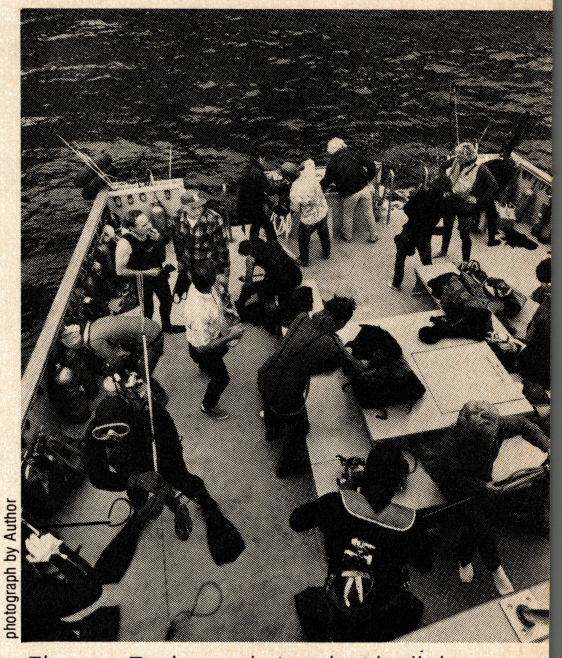
Photograph by Roy O'Brien

In 1965, Robert Marx led a project to excavate the sunken city of Port Royal. He feels that there is a particular urgency to excavate U/W sites threatened by man and nature.


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Divers everywhere have turned to photography to record and preserve their underwater worlds. And the camera they turn to is almost invariably the Nikonos II, by Nikon. It boasts optics unsurpassed for sharp, crisp, full-color quality. And, since it needs no housing, you simply grab the camera and dive. There's a complete Nikonos System for underwater photography. At Nikon camera dealers and selected dive shops. Or write Folio 12, Nikon Inc., Garden City, N.Y. 11530. EPi
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THE ULTIMATE DIVE BOAT

By Jack McKenney



photograph by Author

The new Truth *was designed with all the conveniences important to sport divers.*

There's a new dive boat running out of San Pedro, southern California, that has to be one of the best designed charter boats I've ever been on. It's called the *Truth*, and is owned and skippered by Roy Hauser. Roy has been skippering diving charter boats for years, and his vast experience and knowledge really proved to be a plus factor when he set about to build into the *Truth* all of the conveniences he felt were important to divers.

The basic hull of the *Truth* is 65 feet long and 22 feet wide — big enough to accommodate 49 people including the crew. Roy prefers to keep his charters to no more than 35 divers, however: 49 divers trying to get ready all at once would make any boat a bit crowded. The *Truth* will sleep 32 single divers, but the majority of the bunks are large doubles. This means that if friends double up, 44 divers can grab some shut-eye while making a long haul out to San Clemente Island or one of the other overnight, long distance dive destinations.

Despite its massive size, the *Truth* will cruise comfortably at 15 knots and will top out at 19.5 knots, pushed along by twin V12 GMC Detroit diesels. One of the fastest dive boats in the San Pedro fleet, the *Truth* can make Catalina in an hour and 25 minutes.

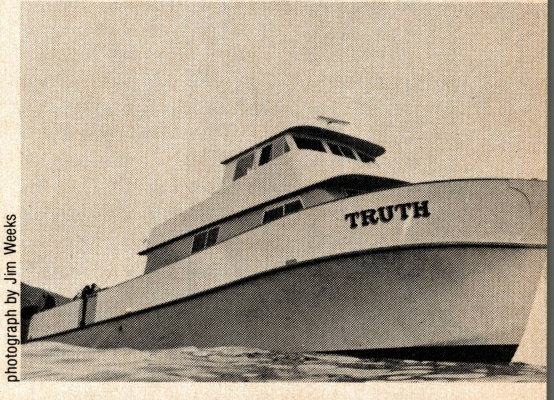
During inclement weather, up to 30 people can sit comfortably in the spacious galley where Roy and his galley girl, Suzy, serve up some pretty good breakfast and lunch combinations. The galley can be used for storing camera gear under the benches, and the large tables are perfect for changing film while in a dry atmosphere. Below deck at the stern are two 15cfm Ingersol Rand compressors that can fill two scuba bottles every three and a half minutes.

Water entry can be made from the bow, but it's best to make your jump from either side amidships. And you know what a hassel it is to spit in your mask, mush it around, walk to where the compressor bucket is, rinse the mask out, and then walk back to where you bail out, especially on a crowded boat. Well, there's no hassel on the *Truth*. At both sides where divers enter the water, Roy has built a mask rinsing tank into the railing with continuous running water — all at one location. It's really a great idea.

At the termination of a dive, it's an easy matter to swim onto the spacious, submerged, heavy duty ramp and climb up one of the two hefty ladders on either side of the stern. There's no waiting around for two or three divers ahead of you to get out of the way. At the end of the dive, once back on board, you can have a shower in one of two hot water showers. There are also two heads—no waiting in line for that either.

Southern California has been known for years for its fine fleet of charter boats that service only divers. Today there are approximately 30 charter boats in the San Pedro area the diver can choose from for a fun-filled, inexpensive way to experience some of the fine diving that the Channel Islands have to offer. And with the addition of Roy Hauser's new *Truth*, the charter diving boat is fast becoming a sophisticated, comfortable way to take part in your favorite sport.

For information about prices, destinations and dates of trips, write to Roy at Truth Diving Corp., 141 West 22nd Street, San Pedro, California 90731.



photograph by Jim Weeks

Despite its size, the Truth *is one of the fastest dive boats in the San Pedro, California fleet. She will cruise comfortably at 15 knots, and can top out at about 19.5 knots.*

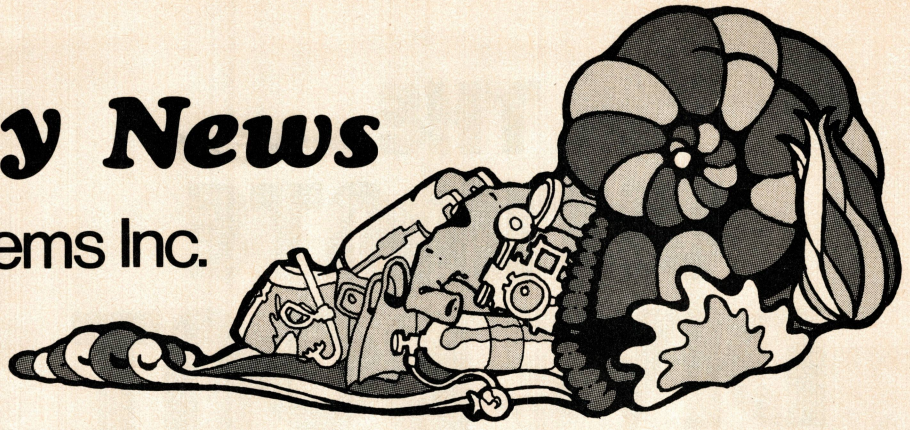


photograph by Author

Roy Hauser, sitting at right, is owner and skipper of the diving-charter boat Truth.

Industry News

Inflatable Systems Inc.



By Sherna Hough

There's an explosion of ideas going on at Inflatable Systems, Inc., parent company of the Seatec line of sport diving equipment. Two very talented personalities, Harry Ruscigno and Lyle Shelton, have combined their multi-faceted experience to form a team which should keep the diving industry excited for a long time to come.

Inflatable Systems was formed in 1969 when Ruscigno, who had an extensive background in aerospace engineering, decided he wanted to get more involved in the one thing he really loved — diving. He looked around for a way to best use his engineering experience and was introduced to Shelton, who has been in the manufacturing end of diving over 15 years. It didn't take long to realize their partnership was bound to be a winner, so they jumped into action with the research, design and experimentation of new products.

The pair's original concept was to produce a buoyancy compensator for the sport diving industry that would be superior to anything on the market at the time. As avid divers themselves, they wanted something that was as cheap, strong and dependable as possible — something that would be as good after a year of tough wear in the marine environment as it was the day of purchase. They tackled problems such as the most efficient design, best materials, and even the optimum number of stitches per inch with the energy of men who knew their lives may depend on their decisions.

To build a strong financial base during their research and development period, Ruscigno and Shelton decided to make some bids in the broader commercial and industrial market. With their unique talents and facilities, they soon were getting large contracts from organizations like the U.S. Navy, North American Rockwell Company and Pan American Airways to produce an amazingly diverse line of products. Each contract was a fascinating challenge to the men, and they poured over their drawing tables, and then experimented in their shop, with creative vigor.

Inflatable Systems markets this line of commercial products under the name ISCO, and technically these products are not aimed at the sport diving market at all. As ISCO continues to grow, however, divers will probably find that at least some of these products will be very interesting to them. One such item is the inflatable boat which was designed for the Navy to give six divers enough room to sit comfortably, store all their gear, be strong and light. It should be ideal for sport diving applications.

Having been diverted by ISCO contracts for almost three years, Inflatable Systems finally introduced their Seatec line of sport diving equipment just over a year ago with a typical burst of energy. Within its first six months Seatec was represented by over 300 dealers, had seven sales representatives, and had doubled its product line. And by the end of this year it will probably double its product line again. There isn't an item in the sport diving field that Seatec isn't examining with a critical eye.

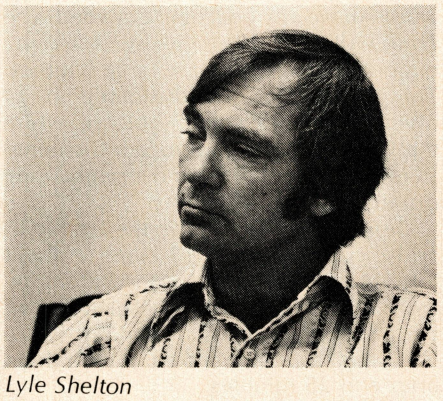
The first item Seatec produced was the long-discussed buoyancy compensator. Ruscigno and Shelton changed rubber parts to thermoplastics, used electronic welding instead of traditional gluing techniques, modified the oral inflation systems of their model, and generally upgraded the state of the art. They have also come out with diving lift bags, gear bags, a fine quality diving knife, a number of diving accessories, and their latest item, the "Third World Suit," which is an inflatable dry suit for optimum diver protection.

All of their work, from design to packaging, is done at Inflatable System's 30,000 square foot building in Orange, California, which used to be, appropriately enough, an orange packing plant. Ruscigno and Shelton installed tons of sophisticated machines capable of performing fascinating functions, and by now they have a production schedule that requires 40 people full-time.

Having fine machinery is just downright fun for designers and engineers like Ruscigno and Shelton, but the true value of their investment is really in the much broader base of quality control of their products. Because of their equipment they can manufacture about 90 percent of everything that goes into their products, from valving to the finishing decorative touches. This gives them a totally closed loop — from design to market — so they know and can guarantee top quality in every item that comes out of their shop.



Harry Ruscigno



photography by Jack McKenney

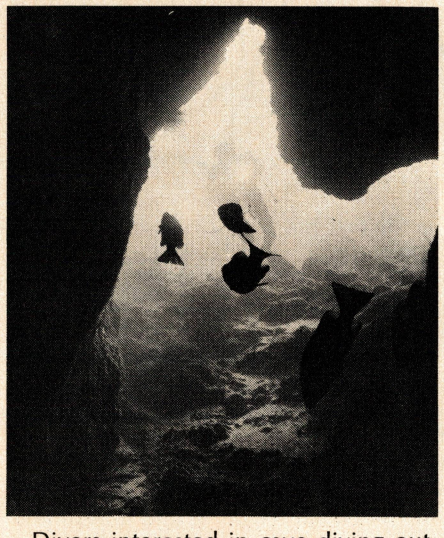
Lyle Shelton

And top quality is top priority to divers Ruscigno and Shelton. They personally use the equipment they make, and are constantly researching, designing, testing and building better systems for more enjoyable diving. The explosion of ideas at Inflatable Systems, where Harry Ruscigno and Lyle Shelton have combined their multi-faceted experience and talents, should keep divers excited for a long time to come.

SIMPLY STUPID

"Cave diving need not be any more dangerous than open water diving . . . but failure to seek information about cave diving prior to making your first cave dive is simply stupid." Thus speaks William Cate, American representative of the Cave Diving Commission of the Intl. Speleological Union. Cate offers contacts and addresses for those interested in information or instruction in cave diving.

The National Assoc. for Cave Diving (NACD), 2900 N.W. 29th Ave., Gainesville, Fla. 32601, provides free safety brochures and also offers courses in cave diving, conducts cave diving seminars and sells books on the subject. The Cave Diving Section of the Natl. Speleological Society (c/o Sheck Exley, 2889 College, Apt. 4, Jacksonville, Fla.) publishes a cave diving newsletter and sponsors cave diving meetings. PADI offers cave diving certification in cooperation with NACD (write: Bob Friedman, 350 Redwood Ln., Key Biscayne, Fla. 33149, for information). Cate also points out that the Florida State Diving Assoc. (900 Grove Park Dr. West, Orange Park, Fla. 32070) has a cave diving committee that will provide basic cave diving safety information about Florida.



Divers interested in cave diving outside the U.S. can contact the Cave Diving Commission of the Intl. Speleological Union (122 Collins St., San Francisco, Calif. 94118). The Union, which publishes an international cave diving newsletter, is attempting to standardize cave diving training, equipment and techniques worldwide.

Says Cate, "Needless cave diving accidents occurred from California to Florida in 1973. The majority of these accidents could have been avoided if the victim had sought advice from the cave diving community prior to making the dive."



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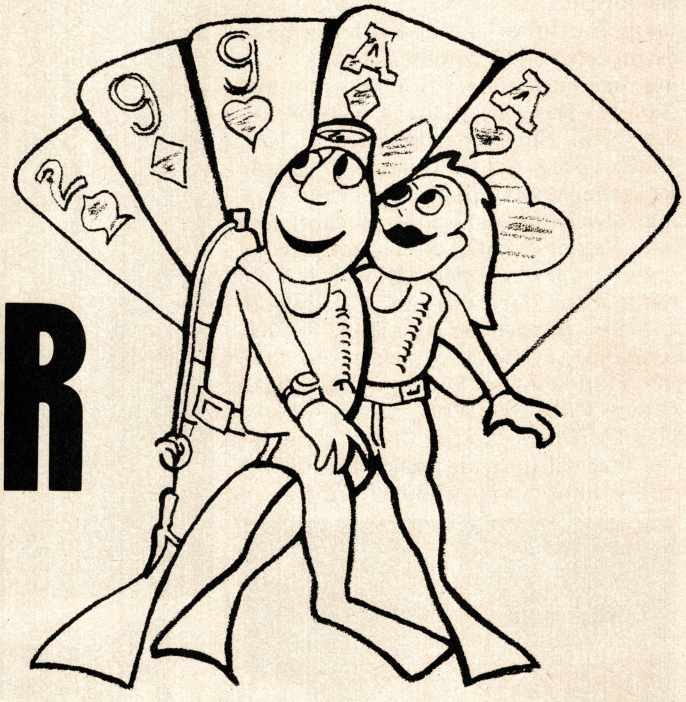
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We're into making diving a safer sport.

SCUBA POKER

A $5000 POT

By Peter C. Howworth



The players certainly did not resemble accomplished poker hands. They smiled too much. Gone were the impassive visages of Vegas; stolid stares were replaced by beaming smiles. Of course the winnings were enough to cause even seasoned hands to smirk, particularly since the odds were in favor of the players. After all, how many people have put in only a few dollars to play a poker hand and come out with a check for a hundred dollars?

This game was really different than a game in the smoke-filled casinos of Nevada. For one thing the cards were not marked; in fact they were stapled together. Add that to the fact that the game was played underwater and even the expressionless countenances of the desert would have raised an eyebrow. The grand prize of $5000 might even have been enough for them to throw caution to the winds and bat an eyelash.

Since this poker game — called Scubapoker — was played underwater, it was not necessary for the players to dexterously shuffle the decks. All that was necessary for them to do was to reach out and grab a card, which was the point of the game.

I recently watched one of the first Scubapoker Tournaments held in southern California. Personnel from various diving stores officiated the event, acting as judges during the tournament. The first step was to register each of the two man teams entering the contest. An entrance fee of $5 was collected from each contestant ($4 for NASDS Club Aquarius Members), and each team was registered on a first-come, first-serve basis. A briefing prior to the beginning of the event was held, insuring that all of the contestants clearly understood the rules.

"OK. Here's how it goes," began Ron Coleman of Underwater Schools of America in Anaheim. "Each team will be checked out for the proper gear before entering the water. You have to dive with a buddy. If you don't have a buddy we'll try to assign you one.

"We'll tie a plastic buoy to your tanks. The buoys are different colors so we can tell one team from another out in the water. Before you enter the water, be sure to give us your estimated air consumption — how much air the two of you will use during the contest. That's in case there's a tie — if two teams get the same poker hand, then the team closest to their estimated air consumption will win the tournament.

"You'll enter the water there," he went on, pointing to the entry point. "Then you will swim out to the starting buoy. Go down the buoy line and you'll find a slate. On the slate will be your compass heading to the first buoy. It will also tell you how long it should take before you reach the first buoy. Once you're underwater, you can't surface unless you're through, otherwise you'll be disqualified. Also you'll have to maintain your depth, using your buoyancy control device. If you go too deep and the plastic buoy attached to your tank goes underwater, you will be disqualified.

"When you arrive at the first buoy, take one card from the line and get your bearings for the next buoy. Only take one card from each buoy, otherwise you'll be disqualified. Then go on to the next buoy. Follow the same procedure until you finish the course or run out of time. The course should take 15 minutes to complete, but we'll give you 30 minutes. If you take any longer than that, you'll be disqualified anyway, so you might as well come in." (The time and distance of each tournament vary according to the conditions prevailing at the time. For example, the judges may set the buoys closer together if the visibility is poor.)

"When you come in, check back with us and turn in your cards. Remember, you need only five to win. If you get all seven, select the best five cards to play. If there's a tie, it will be settled by which team comes closest to their estimated air consumption. We'll check your pressure gauges when you check back in.

"One more thing: don't mess around with the buoys. If you cut a buoy line or move any of the buoys you'll be disqualified.

"Are there any questions? No? OK. The first team can go ahead and get ready. We'll send the teams out at five minute intervals."

There was a scurry of activity as each team headed for their gear. Murmured strategies could be heard from each team as the contestants eagerly prepared for the contest. I donned my wet suit, heated to a delicious warmth by the friendly sun. Spectators lined the beach, armed with ice chests of cold beer and smeared with the familiar sun lotions of summer.

I backed into the surf, grateful for the welcome rush of cool water after the heat of the beach. Already the first team was receiving their final check-out before entering the water. At the starting buoy I floated comfortably, waiting for the first team to arrive. Gliding down to the bottom, I observed that the visibility was poor, explaining the rather close proximity of the next buoy. The team arrived, and after a quick exchange of words, submerged to the slate on the buoy line. Hand in hand, they sat out across the barren sand, one diver reading the compass as the other continually scanned the murky depths for the next buoy. I watched them probing their way along through the turbid water.

It was sure a lot harder than it looked from shore, I thought, noticing how the swells threw the divers slightly off course. Although each team had the opportunity to check the accuracy of their compasses before setting out, swells and turbid water often made the contest one of skill and training. Each team had to be accurate in their navigation in order to complete the course. Also, each team had to be able to maintain a proper depth so that the plastic buoys did not submerge. Skillful utilization of buoyancy control devices assisted the teams in maintaining their proper depths, and accurate air consumption estimations were used to make or break a team in the event of a tie. It was this combination of factors which made this contest a test of skill rather than of luck.

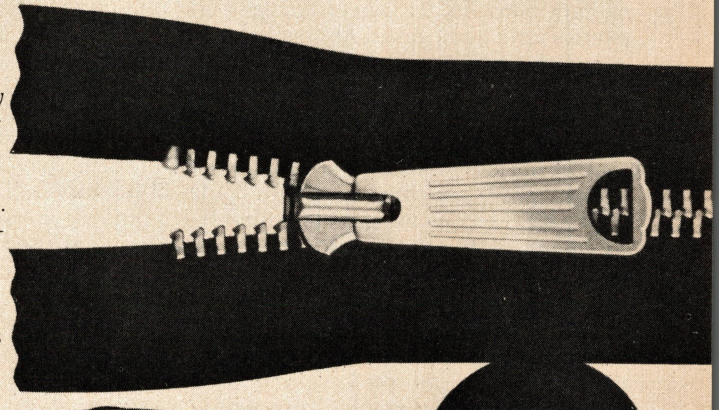
I swam ahead of the first team toward the next buoy, noticing as I did so that another team had already reached the starting point. I slid down to the bottom, noting the instructions written on the slate and the cards secured to the buoy line. Fifty two cards. Fifty two chances. And on the other buoys, the same thing. Seven decks of cards. Seven chances of winning. At the local levels they were giving away $100 for first place, $50 for second, $25 for third. At the regional level — given in five areas of the United States for the winners of the local contests — they would give away $1000 first prizes. At the nationals they would give away a whopping $5000 in cash. It was really something to think about.

I looked again at the cards. There would be no cheating in this poker game. The cards were all securely stapled together. There was no chance to select the best cards. Since only the officials could recognize which deck came from each buoy, there could be no hoarding of cards from one buoy, which was against the rules anyway.

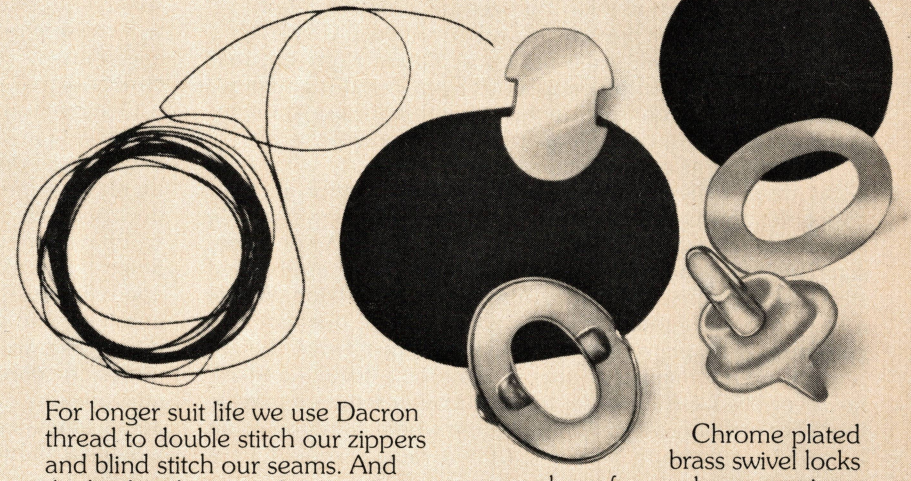
(Continued on Page 59)

We go to pieces every time we make a suit.

And the pieces we go to are rust-proof, rot-proof and jam-proof. Here's proof:

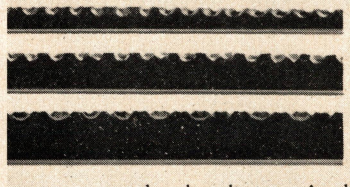


The heavy duty Parkway zipper is nickel silver fastened to reinforced tape. It slides easily—wet, salty, or sandy. And it will slide just as easily five years from now.



For longer suit life we use Dacron thread to double stitch our zippers and blind stitch our seams. And that's after they are glue bonded.

Chrome plated brass swivel locks have ferrous bronze springs. They hold securely. Flip open with two fingers. They're attached to the suit with metal-to-metal fasteners and impregnated neoprene panels.



Only perfect sheets of closed-cell Rubatex G231N nitrogen blown neoprene reach our cutting room. Each sheet has our famous shark-skin two texture, and nylon lining. And we gauge the thickness, exactly—1/8", 3/16", 1/4". (One is sure to be just right for your diving conditions.)

When the parts are perfect we cut, fit, bond, sew. We test, try, adjust, inspect. Soon we have a sleeve, a jacket, a suit. In all sizes for men and women.
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Parkway Fabricators

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HOW PURE IS THE AIR YOU BREATHE?

By Leo G. Bellarts, Jr.

During the 1960s and continuing into the 1970s, there has been a phenomenal rise in the popularity of recreational scuba diving. Most divers obtain their air at a skin diving store or on a dive boat, with the quality of air supplied and the condition and configuration of the equipment varying greatly from shop to shop, and boat to boat. While fatalities occurring from contaminated air have been few, there have been many cases of nausea or other illness caused by impure, compressed air. Perhaps with a knowledge of the causes of impure air and the steps necessary to obtain pure air, operators and owners of compressed air plants can take better precautions to insure the health and safety of their customers.

Definition of pure air — The first consideration in designing a system that will deliver pure air is to establish a definition of pure air. We know that air is a mixture of gases, roughly 78 percent nitrogen, 21 percent oxygen and one percent other atmospheric trace gases. Atmospheric air also contains water vapor and varying amounts of air borne contaminants. The Compressed Gas Association, in its pamphlet G-7, *Compressed Air for Human Respiration*, grades gaseous air by limiting the concentration of specific trace constituents. These grades are identified as grades A through J. For underwater breathing, we are concerned with grades D through G.

GRADE D: The minimum grade for routine use in self-contained or supplied-air breathing equipment, as used in shallow water diving, or general respiratory use. For use at temp. below freezing, water content should be reduced.

GRADE E: For use in self-contained or air-supplied breathing equipment used underwater, or in hyperbaric chambers where the pressure and duration of exposure are such that a "decompression" procedure is necessitated.

GRADE F: For high pressure hyperbaric or deep U/W usage.

GRADE G: For the same usages as Grade F, except that because of the limitation on gaseous hydrocarbons and other contaminants it is considered more suitable for use at higher ambient pressures, or for longer periods of exposure.

The limitations on trace constituents for grades D through G, as defined by the Compressed Gas Association in their "Specification G-7.1," are shown in the adjoining chart. In addition to the standards of the Compressed Gas Association, state agencies and other regulating bodies have established standards for pure air for areas under their jurisdiction. Where a local or state standard applies, the owner or operator of a compressed air plant should familiarize himself with the applicable requirements. In the absence of a local standard, however, the CGA limits for the grade of air required may be used. For ordinary air station operation where compressed air is sold to recreational divers, CGA Grade E should be a minimum standard.

Sources of contaminants in air supply — With the definition of pure air established, insofar as our requirements are concerned, we need an understanding of the sources of contaminants that can make atmospheric air unfit for breathing. Two sources of toxic impurities are found in compressed air: those introduced into the compressor from the atmosphere, and those produced in the compressor itself.

From the standpoint of airborne pollutants or smog, the physical location of a compressor is especially important. An urban or industrial environment with high concentrations of gasoline or diesel engine exhaust fumes, emissions from industrial furnaces, or airborne dirt and grit, provides a poor reservoir of air to compress for breathing purposes.

Contaminants generated inside the compressor are basically attributed to the oil used in lubrication. Over-heating of the compressor will cause partial combustion of oil carbon deposits resulting in the formation of carbon monoxide. Even with the compressor operating normally, lubricating oil will be carried as a vapor or mist into the system, coating the inside of piping and storage bottles, and will be found in the air discharge. Another contaminant, nitrogen dioxide, can also be produced in hot compression chambers.

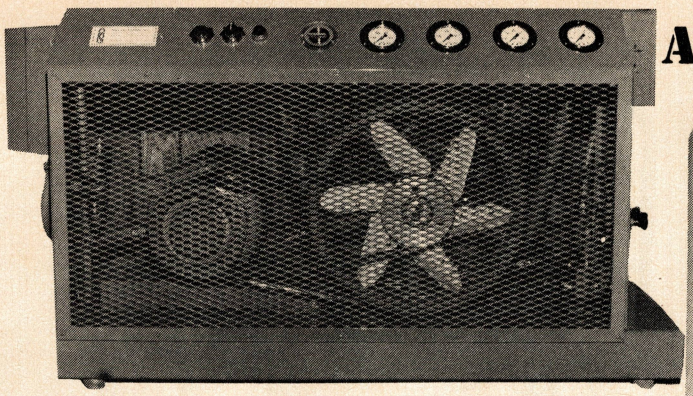
Carbon monoxide is the contaminant which is of the greatest concern for divers, and carbon monoxide can be found either in atmospheric air or generated within the compressor. The carbon monoxide level in the ambient air is generally spotty, with high concentrations at sources such as freeways. In diving, however, the effects of contaminants on the human body are magnified with an increase in depth. At a depth of 100 feet, for instance, the physiological effect of breathing carbon monoxide is four times that at the surface. And even a minimal amount of carbon monoxide can impair judgement, deaden the senses, cause nausea and even death.

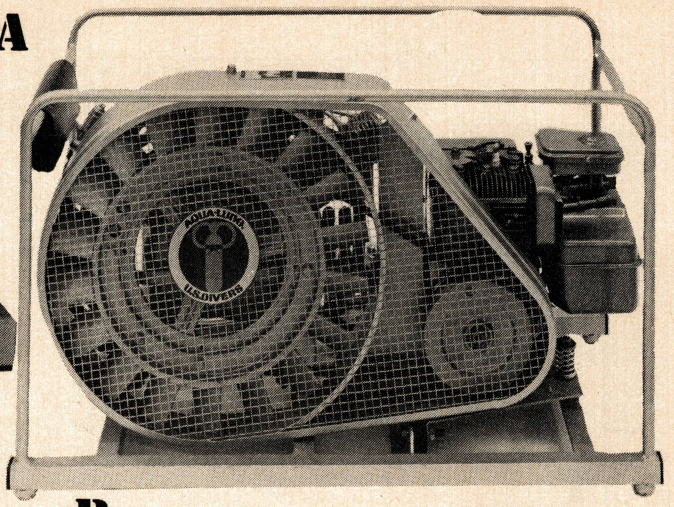
The danger from excess carbon dioxide in the diver's air is respiratory fatigue. Excess oil in the diver's air can cause lipoid pneumonia, and nitrogen dioxide can lead to respiratory problems. However, the strong odor of nitrogen dioxide should alert the diver to an unsafe air supply.

One other component of air, although not a contaminant as such, requires consideration. This is water vapor. Water vapor will cause corrosion within breathing equipment, air storage and scuba tanks. Under certain conditions, water vapor will condense and freeze, affecting proper equipment operation.

One method of expressing the moisture of the air is by dew point — that is, the temperature of the air at which moisture begins to be deposited. The dew point of compressed air will increase as the pressure is increased. For example, air with a dew point of -35 degrees Fahrenheit at atmospheric pressure will have a dew point of 55 degrees Fahrenheit at 2200 psi. Since this is the charging pressure for scuba tanks and the approximate water temperature off the northern California coast, we can see how moisture will form inside scuba tanks. (Of course, with this -35 degree Fahrenheit dew point at atmospheric pressure, as the air in the tank is consumed and the tank pressure drops, the pressure dew point will decrease. The actual amount of condensed moisture under this circumstance would be minimal.)

Federal Specification BB-A-1034A, "Air, Compressed, for Breathing Purposes," classes air into two grades — high purity/low water content, and standard purity/low water content — with respective limiting dew point of -38 degrees Fahrenheit and -20 degrees Fahrenheit at atmospheric pressure. The carbon monoxide level is limited to 10 ppm for both grades. The Navy, according to the *U.S. Navy Diving Manual*, NAVSHIPS 0994-001-9010, March, 1970, has found that a dew point of -25 degrees Fahrenheit at atmosphic pressure is adequate for most diving situations.





A **PRESSURE SYSTEMS, INC. Model HAE-16 (diesel, gas, electric). Rated: 12 cfm at 3500 psi at 725 rpm; 16 cfm at 3500 psi at 900 rpm. Dimensions: 47"x25"x25". Diesel, 910 lbs., $6,148; Gas, 715 lbs., $4,967; Electric, 595 lbs., single phase $4,766., three phase, $4,618. Contact: Pressure Systems, 1712 B Spring Garden, Greensboro, N.C.**

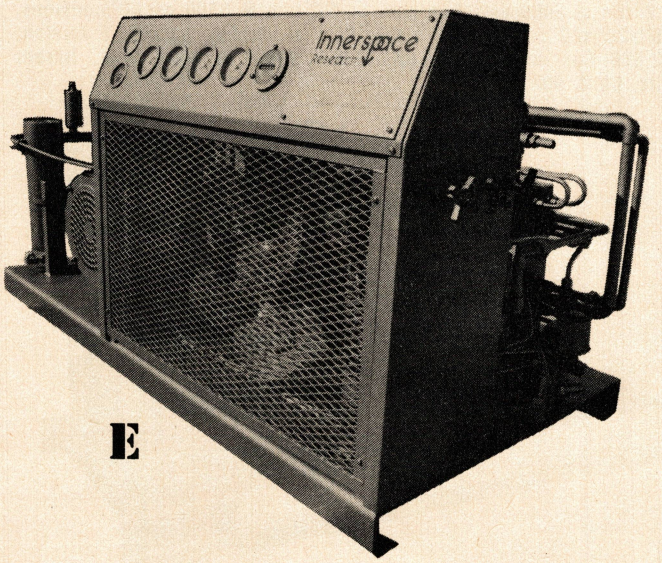
B **U.S. DIVERS CO., Model 2310 (gas, electric — phase 1,phase 3). Rated: 5 cfm at 3200 psi. Dimensions: 31"x15"x20". Weight: Gas, 190 lbs., Electric, 205 lbs. $2,030. Contact: U.S. Divers Co.**

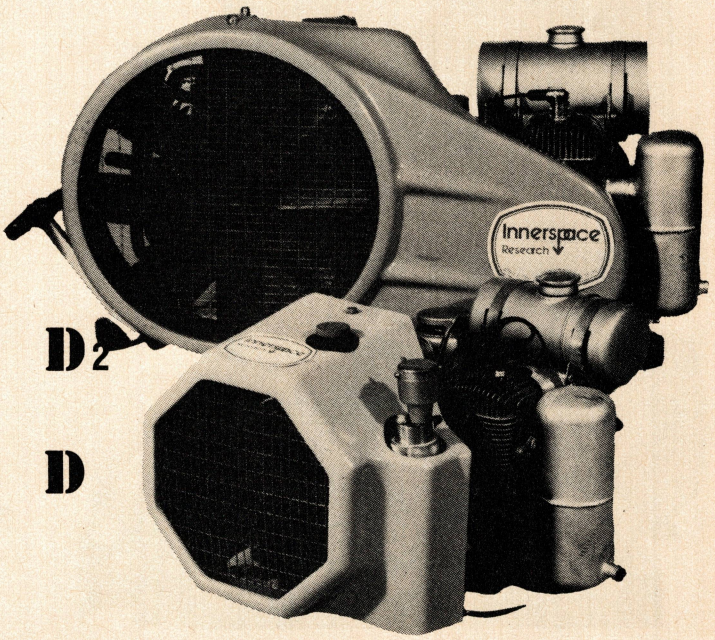
C **U.S. DIVERS CO., Model 2300 (gas). Rated: 2.1 cfm at 3200 psi. Dimensions: 16"x13"x30". Weight: 65 lbs. $1,220. Contact: U.S. Divers Co., 3323 W. Warner Ave., Santa Ana, Ca. 92702.**

D **INNERSPACE RESEARCH, Model H 5000-GA3 (gas, electric, diesel). Rated: 3 cfm at 5000 psi. Dimensions: 16"x21"x21". Weight: 70 lbs. $1,795. Contact: Innerspace Research, 4780 E. 11th Ave., Hialeah, Fla.**

D2 **INNERSPACE RESEARCH, Model H 5000-GA7 (gas, electric, diesel). Rated: 7 cfm at 5000 psi. Dimensions: 38"x21"x18". Weight: 147 lbs. $2,995. Contact: Innerspace Research.**

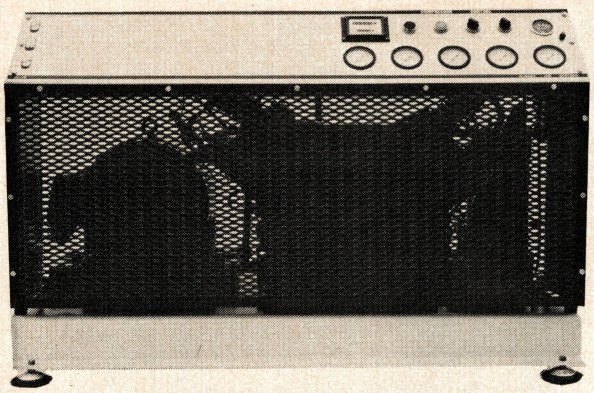
E **INNERSPACE RESEARCH, Model H 5000-EW (electric). Rated: 18 cfm at 6000 psi. Dimensions: 56"x27"x32". Weight: 900 lbs. $6,000. Contact: Innerspace Research, 4780 E. 11th, Hialeah, Florida 33013.**



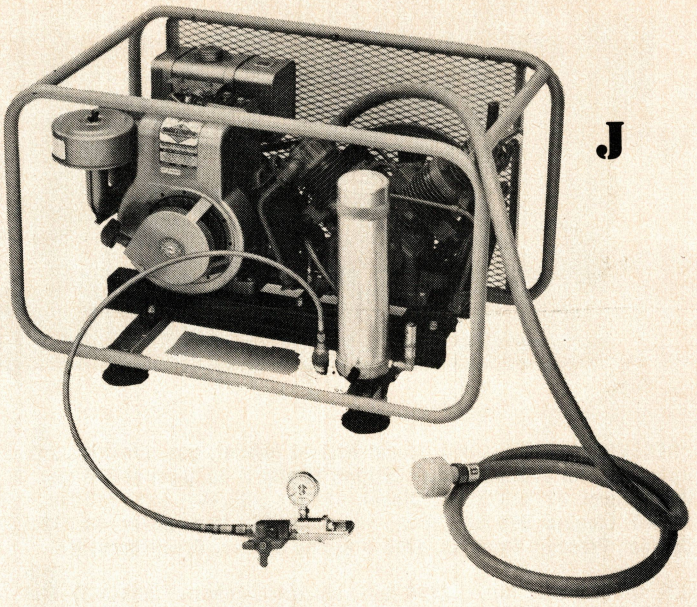


Up to this point we have determined what pure air is and have identified the sources that contaminate air. Now we can proceed and look at an air compressor system and the various components which are available to compress, purify and dehumidify atmospheric air.

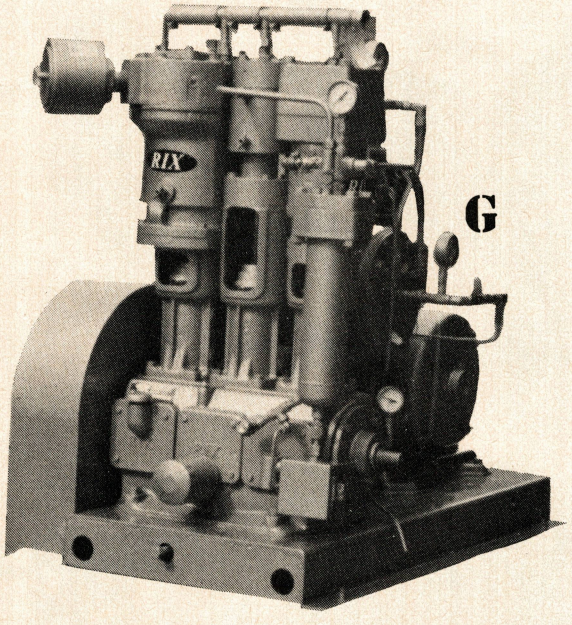
Air Compressor Systems — Air enters the compressor system through an air intake filter which will remove airborne particles from the air. This device is especially important in an urban area with high levels of smog or air pollution. The air inlet should be located upstream and away from chimneys and exhaust stacks as well as heavily traveled freeways. On smaller air cooled compressors, the intake is normally located on the compressor itself. The same applies in locating the air inlet (compressor) away from sources of contamination.



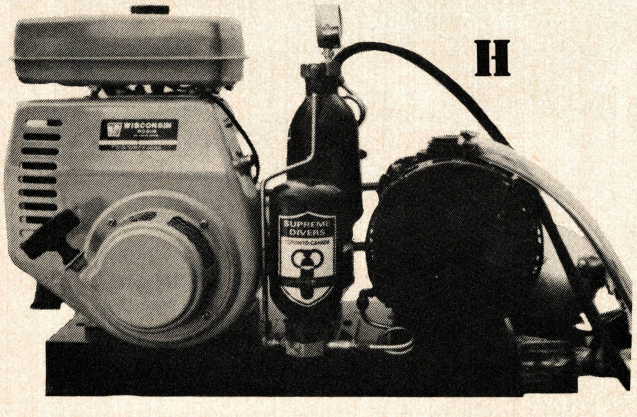
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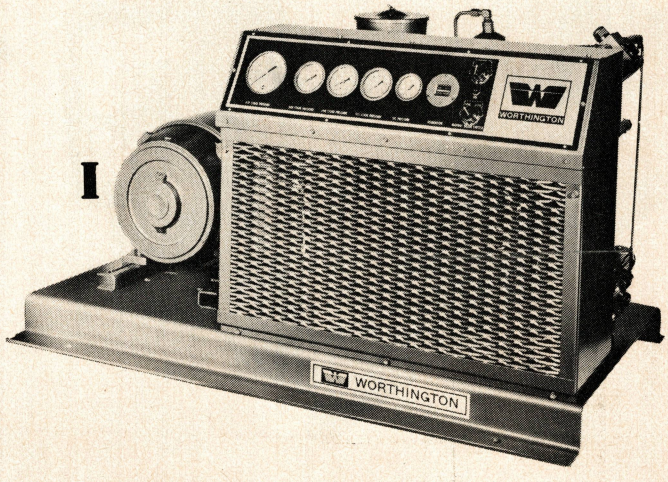
F **SUBSEA AIR SYSTEMS, Model SC-15 (electric). Rated: 15 cfm at 3500 psi. Dimensions: 27"x48"x32". Weight: 850 lbs. $3,850. Contact: Subsea Air Systems, 3816 Cheasty Blvd. So., Seattle, Wash. 98108.**

G **RIX INDUSTRIES, Model KB44 (electric, gas). Rated 30 cfm at 3500 psi, Dimensions: 46"x44"x30". Weight: 1275 lbs. $9,836. Contact: Rix Industries, 6460 Hollis St., Emeryville, Ca. 94608.**

H **SUPREME DIVERS, Model W 3000 K4 (gas). Rated: 4 cfm at 3000 psi. Dimensions: 26"x24"x18". Weight: 98 lbs., $1,495. Contact: Supreme Divers, 168-170 King St. E., Toronto, Ontario M5A1J3, Canada.**

I **WORTHINGTON COMPRESSOR INC., Model 20SABC (electric). Rated:20 cfm at 3500 psi. Dimensions: 56"x32"30". Weight: approx. 1070 lbs. Cost: approx. $5,000. Contact: Worthington Compressor, Inc., 37 Appleton St., Holyoke, Mass. 01040.**

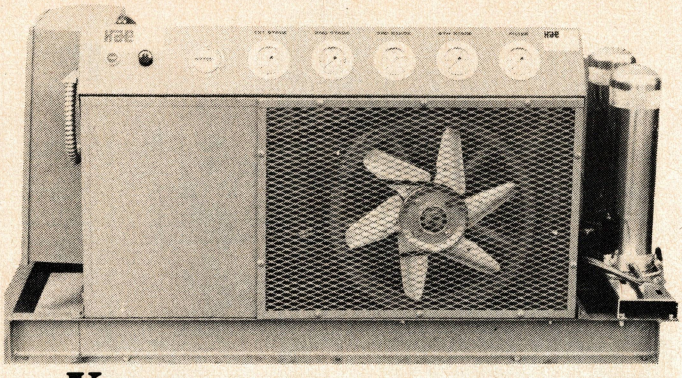
J **AMERICAN BRISTOL IND., Model ABI-7G (gas). Rated: K version — 5.2 cfm at 6000 psi; J version — 5.2 cfm at 3500 psi. Dimensions: 35"x20"x20". Weight: 175 lbs. Cost: K version, $3,242; J version, $2,626. Contact: American Bristol Ind., 25032 Broadwell Ave., Harbor City, Calif. 90710.**



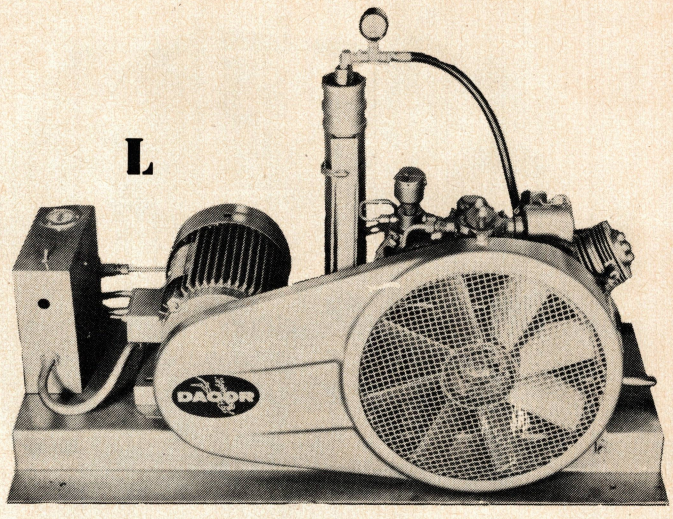
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A well-maintained filter, in addition to being the first step in purifying the air, extends the life of a compressor substantially by preventing wear-causing particles from entering the compressor. An excellent air intake line is PVC plastic pipe which is non-corrosive, thereby eliminating another possible source of contamination.

The next device in the system is the compressor. As the name implies, this device compresses the air to the desired pressure. During the compression cycle, heat is absorbed by the air. This heat is then removed by the aftercooler. Except for larger systems, the aftercooler is normally built into the compressor. The cooling of the compressor, and aftercooling of the air, is accomplished by either air or water. Hence, we have two classes of compressors, air cooled and water cooled. More



K



L

AMERICAN BRISTOL IND., Model ABI-25E3 (electric). Rated: 21 cfm at 4500 psi. Dimensions: 56"x26"x28". Weight: 650 lbs. $5,570. Contact: American Bristol Ind., 25032 Broadwell Ave., Harbor City, Calif. **K**

DACOR CORP., Model CP-7E (electric; gas also available). Rated: 7 cfm at 3500 psi (3800 and 4800 psi models available on special order). Dimensions: 46"x23½"x26". Weight: 289 lbs. $3,800. Contact: Dacor Corp., 161 Northfield Road, Northfield, Ill. 60093. **L**

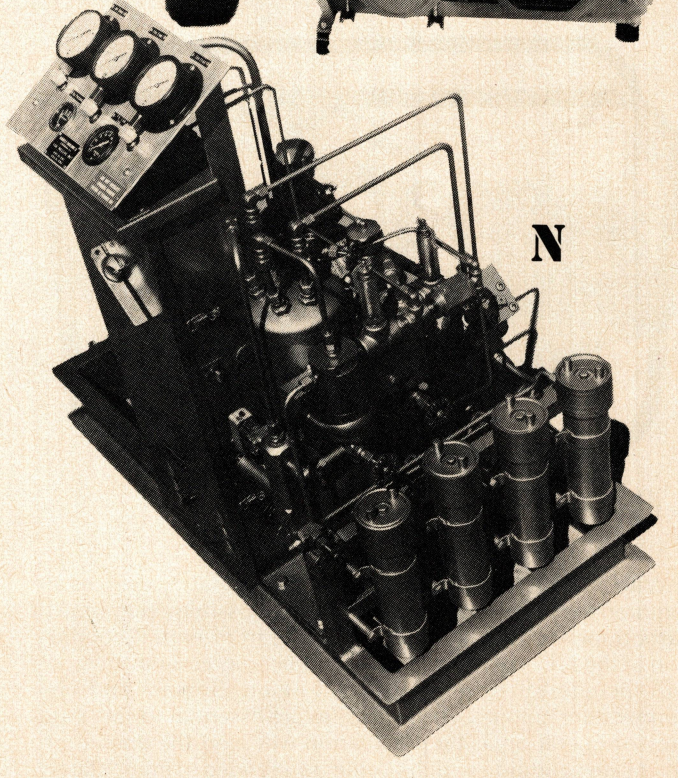
DACOR CORP., Model CP-3G (gas, electric also available). Rated: 3 cfm at 3200 psi. Dimensions: 35"x15"x19¼". Weight: 110 lbs. $1,695. Contact: Dacor Corp. 161 Northfield Rd., Northfield, Ill. 60093. **M**

McWHORTER ENGINEERING CO., Model V2A4 Ewp (electric). Rated: 18.3 cfm at 5000 psi. Dimensions: 60"x34"x30". Weight: 1000 lbs. $2,885. Contact: McWhorter Engineering Co., Box 9014, Plant 1053 Gadsden Rd., Birmingham, Alabama 35213. **N**

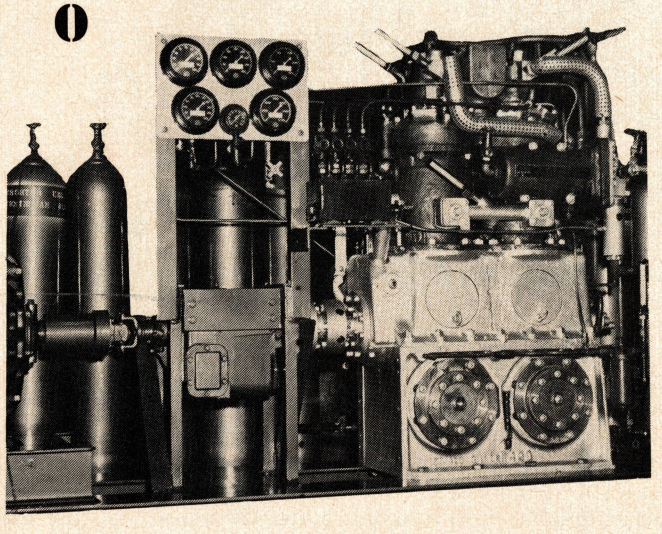
McWHORTER ENGINEERING CO., Model JJEHP (electric). Rated: 94.8 cfm at 4000 psi at max. 50 hp; 47.4 cfm at 4000 psi at low 25 hp. Dimensions: 8'x5½'x4'. Weight: 5000 lbs. Cost: 50 hp, $35,000. 25 hp, $30,000. Contact: McWhorter Engineering Co., Box 9014, Plant 1053 Gadsden Rd., Birmingham, Alabama 35213. **O**



M



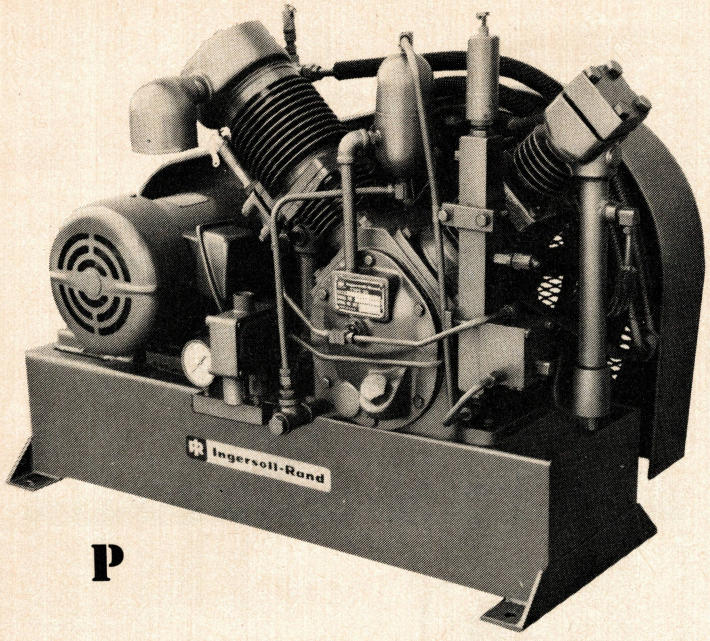
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commonly used are air cooled compressors, being comparatively smaller, lighter, and less expensive. The water cooled type are usually found in stationary installations where large quantities of high quality air are required.

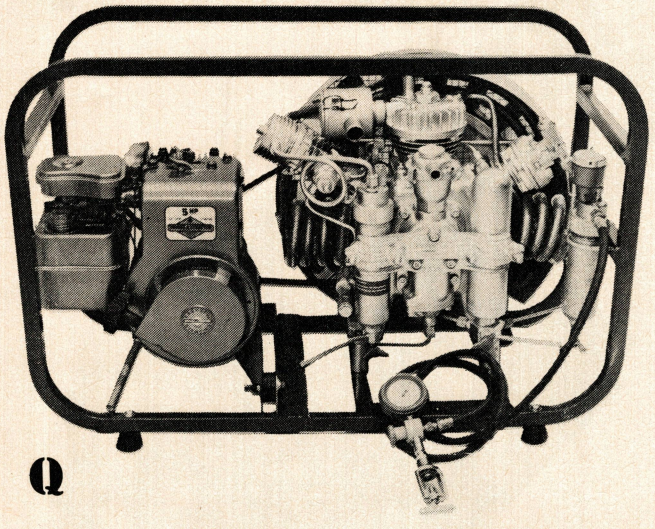
The lubricant used in the compressor is a major consideration. The most common compressors are those that use oil or water as a lubricant. There are also non-lubricated compressors using Teflon or carbon compounds as piston rings. From the standpoint of air purity, the water or non-lubricated compressor is preferred. However, water as a lubricant is not as effective as oil and compressor maintenance costs are generally higher. This is also true of the non-lubricated compressor. Current research to improve maintenance experience with non-lubricated compressors looks promising.



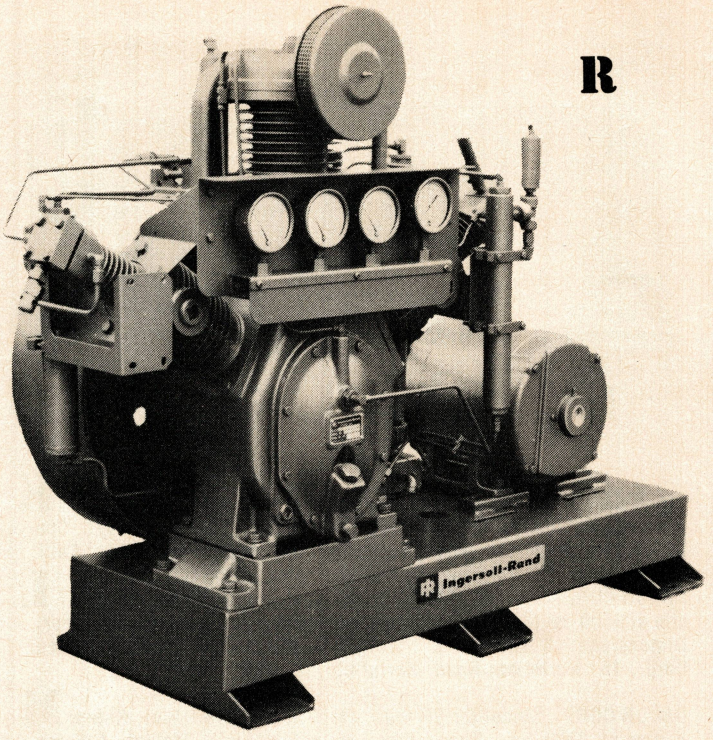
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P TRIDENT SYSTEMS, INC., Model 223 (single or three phase electric). Rated: 9.55 cfm at 3000 psi. Dimensions: 42"x21½"x28". Weight: 500 lbs. Cost: single phase, $2,474; three phase, $2,236. Contact: Trident Systems, Inc., 325 Hickory Ave., Merritt Island, Fla. 32952.

Q MAKO ENGINEERING, Model 5 k-51-GF (gas). Rated: 5 cfm at 3200 psi. Dimensions: 38"x17"x24". Weight: 187 lbs. $1,850. Contact: Mako Engineering, 3131 NE 188th St., Miami, Florida 33160.



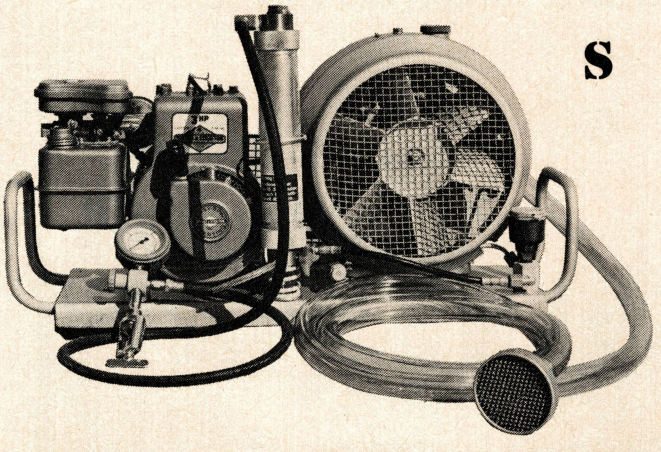
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R

R TRIDENT SYSTEMS, INC., Model 15T4 and H15T4 (three phase electric). Rated: Model 15T4, 36.8 cfm at 3500 psi; Model H15T4, 36.8 cfm at 5000 psi. Dimensions: 58⅜"x27"x45½". Weight: 1145 lbs. Cost: 15T4, $5,941; H15T4, $6,083. Contact: Trident Systems, Inc. 325 Hickory Ave., Merritt Island, Fla. 32952.

S MAKO ENGINEERING, Model Purus (gas). Rated: 2.6 cfm at 3200 psi. Dimensions: 32"x13"x17". Weight: 90 lbs. $1,035. Contact: Mako Engineering, 3131 N.E. 188th St., Miami, Fla. 33160.

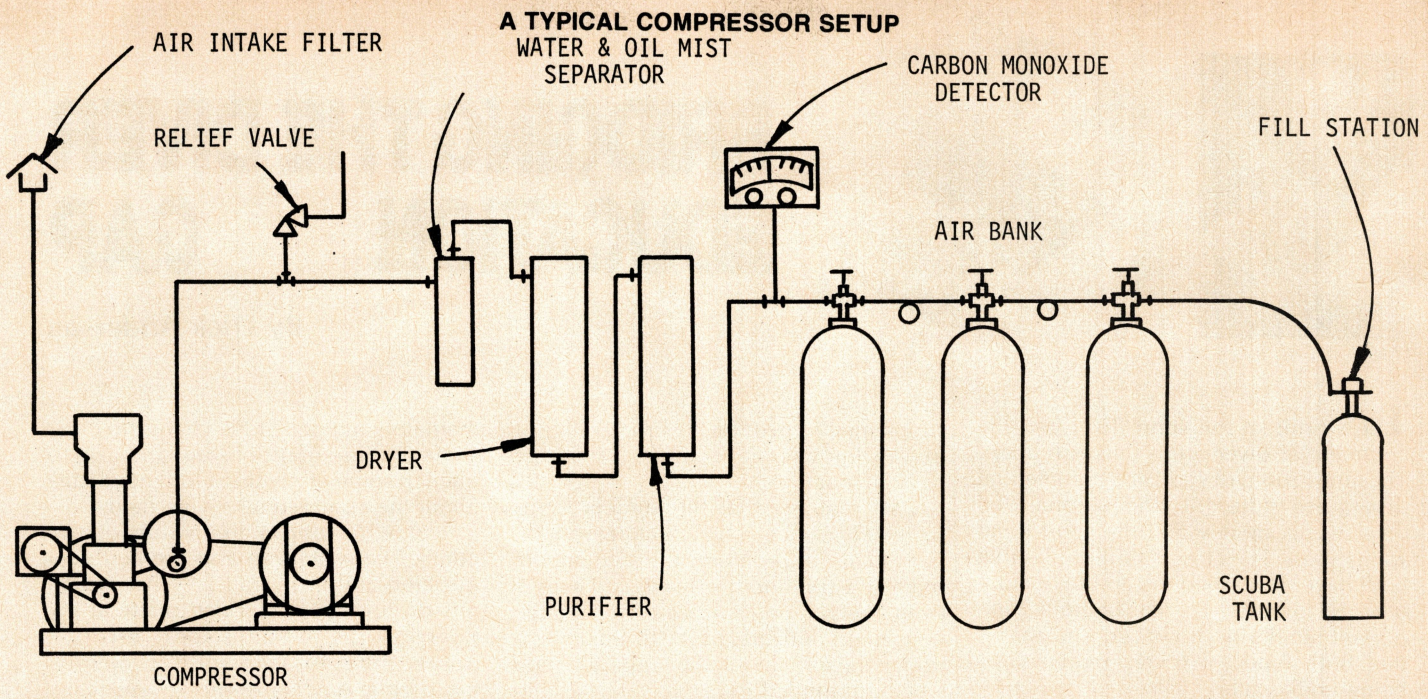


S

With an oil lubricant compressor, certain safety devices are required to prevent overheating and the possible generation of carbon monoxide and carbon dioxide from partial combustion of the oil. A normal oil lubricated compressor installation will include safety relief valves, low oil pressure and high temperature cutouts. These devices are essential to safe compressor operation as their actuation will alert the operator to an unsafe condition which should be attended to immediately. The lubricating oil used should have a low sulfur content and have a flashpoint above 800 degrees Fahrenheit.

The compressed air, after leaving the compressor aftercooler, is in a saturated condition and will carry along with it droplets of entrained water, and in the case of an oil lubricated compressor, oil. These droplets are removed in an oil/water mist filter or separator. Additional moisture may be removed from the air stream by the use of various types of dryers. There are dessicants and regenerative type dryers as well as mechanically refrigerated dryers.

Selection of the dryer will depend upon the dew point desired, as well as initial and operating costs. As previously stated, the compressed air leaving the aftercooler is saturated. Any additional drop in temperature will cause moisture to condense. To prevent this from happening in the diver's breathing equipment, causing rust and eventual failure, the moisture is removed from the air by the dryer thereby lowering the dew point. Dew points as low as -100 degrees Fahrenheit at atmospheric pressure are obtainable from dessicant type dryers in the newly installed condition. As the dessicant absorbs moisture, however, the ability to maintain this low dew point can deteriorate to about -20 degrees Fahrenheit.



COMPRESSED GAS ASSOC. LIMITATIONS OF TRACE CONSTITUENTS

	TYPE 1 (GASEOUS) GRADES			
Limiting Characteristics	D	E	F	G
% 0^2 (v/v) Balance Predominantly N^2 (Note 1)	atm/ 19-23	atm/ 19-23	atm/ 19-23	atm/ 19-23
Water	Note 3	Note 3	Note 3	Note 3
Hydrocarbons (condensed) in Mg/m^3 of gas at NTP (Note 3)	5	5		
Carbon Monoxide	20	10	5	5
Odor	Note 5	Note 5	Note 5	Note 5
Carbon Dioxide	1000	500	500	500
Gaseous Hydrocarbons (as methane)			25	15
Nitrogen Dioxide				2.5
Nitrous Oxide				
Sulfur Dioxide				2.5
Halogenated Solvents				10
Acetylene				
Permanent Particulates				

NOTE 1: Values shown are in parts per million by volume (ppm, v/v).
NOTE 2: The term "atm" (atmospheric) denotes the oxygen content normally present in atmospheric air.
NOTE 3: The water content of compressed air required for any particular grade may vary with the intended use from saturated to very dry. If a specific water limit is required, it should be specified as a limiting dew point or concentration in ppm (v/v). Dew point is expressed in temperature degrees Fahrenheit at one atmosphere absolute pressure (760 mm Hg).
NOTE 4: No limits are given for condensed hydrocarbons beyond grade E since the gaseous hydrocarbon limits could not be met if condensed hydrocarbons were present.
NOTE 5: Measurement of odor is impractical. Air normally may have a slight odor. The presence of a pronounced odor would render the air unsatisfactory.

The next device the air enters is a purifier. The purifier can consist of one or more cartridges containing various dessicants designed to remove the contaminants from the air stream, as well as additional amounts of water and oil vapor. The selection of these will depend upon the grade of air desired, the type of compressor used (i.e., oil or water lubricated), and the physical location of the compressor (i.e., ambient pollution). It is relatively easy to purify air, however, and there are a number of respiratory air specialists who can be contacted if any unusual problems arise.

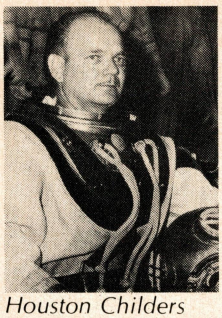
Following purification, an additional safety device can be installed in the system, and that is a carbon monoxide alarm. This alarm will ring and, if desired, can be wired to shut down the compressor when carbon monoxide is present above a predetermined setting as a result of equipment failure or ambient pollution.

From this point, the air goes to the high pressure storage bottles for eventual use in filling scuba tanks, or to a pressure reducing station for use in various devices, such as a recompression chamber.

The complexity of the compressor installation will depend on the amount of air required and the pressure at which it is required. The purifying and dehumidification portion of the system will depend upon the grade of air desired and the existence of possible sources of contaminants. In selecting a compressor system, the manufacturers should be advised of the intended use of the components and the conditions under which they will operate. The manufacturer's recommendations for installation and operation of each component should be closely followed.

Even the best designed system can become a potential hazard due to neglect or improper maintenance. The manufacturer's recommendations for servicing and maintenance of his equipment should be followed. A running time recorder or hourmeter on the compressor is a valuable aid in determining the frequency of maintenance. In any case, a positive program should be followed for replacing filters, dessicants, servicing the compressor, and pressure testing air flasks, etc. A compressed air sample should be collected and analyzed at a three month minimum. Without a carbon monoxide alarm, an oil lubricated compressor should be checked for carbon monoxide every other week, at a minimum. Various kits and testing materials are available for testing air samples, and in some areas the local health department may be of assistance.

A log of all repairs, maintenance and tests performed upon the compressor system should be kept. This will not only be a valuable aid in scheduling periodic maintenance, but will be of material benefit in case of a legal suit arising from an accident to a customer while diving. The goal of every compressor operator should be to insure safe diving by providing air of a quality suitable for use by his customers.



Houston Childers



BRIDGING THE DIVER EDUCATION GAP

By Dick Anderson

The worlds of the sport diver and the commercial diver are a universe apart. The motivations of sport and commercial divers are different: the commercial diver wants money and the sport diver wants sport. The closest similarity is that both have developed the ability to manufacture bubbles. There is one other important similarity, however, and that is that both types of divers really enjoy being underwater.

Most sport divers would like to make money with their diving, but if a sport diver wants to become a commercial diver he needs advanced and specialized training. This means enrolling in one of the commercial diving schools, spending a few months time and spending a few thousand bucks. Some guys are just not quite in the position to do this, but they would still like to turn their diving to dollars. How do they do it?

Then there is the sport diver who has already made a few bucks with his diving. Commercial diving looks interesting to him, but he is not sure that he really wants to get into it. Not sure enough, that is, to invest a couple thousand bucks in a commercial school to find out. What does he do?

And then there is the underwater instructor. He wants to advance his knowledge of the total diving picture, but he doesn't want to skip off to Florida or Seattle or California or Texas to attend a diving school. What does he do?

Well, there is an answer.

Houston Childers has filled the diver's education gap by founding a home study school for divers. It's called Underwater Mechanics International, or UMI, and the course is "Principles of Commercial Diving." It is certificated by the Texas Education Agency, Texas State Department of Education.

The best thing about the course is the absolute value of the educational material offered. The next best thing is the price. It's only $185 bucks. A paltry sum. Plus $8.50 for the textbook, which is the *U.S. Navy Diving Manual*, March, 1970. But, even if you don't want to plunk down $185, you can get started for only $32 down and $17 per month (with no interest or carrying charges). The $32 covers the registration fee, Assignment 1, and the physics workbook. There are ten assignments with various instructional supplements covering the broad range of diving knowledge crammed into the navy manual.

UMI requires that the student complete at least one assignment per month, but in case of problems the student can request a six month extension. There is even a refund policy in case you change your mind mid-stream. With the exception of the initial $32, the prepaid tuition will be refunded on a pro rata basis in accordance with assignments completed. How can you beat that?

The course is administered under the direct supervision of Houston Childers, and he is an old hand in the business of diving and diver education. He spent 26 years in the navy and holds the status of Master Diver. He was Assistant Officer in Charge of the U.S. Navy Experimental Diving Unit working in development of diving equipment and techniques, and saturation diver training of the SeaLab aquanauts to the depth of 1025 feet. After retiring from the navy he founded Childers Diving Corporation and established two commercial-industrial diving schools. Besides knowing a lot about diving, he is also a member of the Marine Technology Society and the Undersea Medical Society.

Some readers may recall an article I wrote for the August, 1970, SKIN DIVER, about the Commercial Diving Center in Wilmington, California. At that time the operation was owned and operated by Houston Childers. (It was later acquired by Oceaneering International.) Before I wrote that article I had to assure myself that the whole program was on the level and that the students were actually learning their trade. A couple of visits to the facility gave me all the assurance I needed. A correspondence course is another matter.

Well, I know that Childers is a dedicated man, but I still wanted to hear it from some of his students. So I got in contact with a few of his students to get a reaction. Larry Beavan of Rockville, Maryland, took the course. Four years ago he completed the NAUI basic scuba course and worked his way up to pool instructor status. He states in part, "All during this time many questions entered my mind and the minds of many of my students. When I saw the advertisement of the course in SKIN DIVER, I immediately jumped at the chance to clear some of these questions up, and also to quench some of my thirst for knowledge about the commercial diving field."

And what about the value of the course? Larry Beavan asks the pertinent question and answers it: "What did all this do for me? It clarified many of my questions as a scuba sport diver. It opened my eyes to the world of commercial diving. And it also showed me many problems that face the diving community. After completing the assignments, I immediately found use for it every time a student asked me a question. This course put me in the position of understanding what was happening in the commercial field around me, and it put me in the position to judge whether or not a diving career was for me." Larry Beavan also had a few appreciative words about the personal attention given his assignments by Houston Childers.

Another UMI graduate is Tom Brooks of Sherman Oaks, California, president of the Telco dive club (the Bell Telephone System). I talked to him on the phone. Tom couldn't say enough about the value of the course. He credits UMI with a tremendous broadening of his general and specific knowledge of diving and related matters. The Telco dive club will expand shortly to General Telephone and Tom Brooks says, "I hope to share the knowledge I received through UMI with as many club chapters as possible." He also says, "Dick, I would recommend the course to anyone, anyone." By that I guess he means anyone.

I got one letter from Brooks Anderson (no relation) of Honolulu, Hawaii, that is filled with pertinent information. Brooks completed the course with a 99 percent average, and here is what he has to say: "I work as an engineering geologist in Honolulu. I was certified by NAUI (basic and advanced) a little over one year ago. My interest in diving stems from my interest in marine geology both as a vocation and avocation. However, I quickly learned that my knowledge of diving safety, procedures and techniques was inadequate for ocean work as a marine engineering geologist. Job commitments prevented me from taking a commercial diving course at a school, so I decided to enroll in the Home Study Course. The course turned out to be the most com-

CAREER OPPORTUNITIES

prehensive and practical course I have taken in ten and one-half years of university training.

Brooks continues: "The course has helped me advance my career. My company got a nice contract to do a sedimentation study off the coast of Oahu, based upon my knowledge of commercial scuba diving procedures learned from the *U.S. Navy Diving Manual*. My last pay raise reflected that fact. I am currently changing jobs to advance my career, and I am specifically being hired as a diving engineering geologist because I have more than a sport diving certification."

Brooks D. Anderson II has seen the UMI course pay off, and the value of his UMI training is reflected in his letter: "I would recommend this course to anyone, sport or commercial diver, who wishes to better understand diving. Childers works with each student individually and answers even the most detailed questions in full. He helpfully critiques many of the incorrectly answered questions and points out why the school answer is correct. He even supplies information on equipment, diving companies and personnel not directly related to the course, when appropriate.

"Correspondence is returned from the school almost overnight except when questions requiring detailed answers are asked — then it is a matter of only a few days. Although I would recommend the course to all divers, they should understand that this is no "snap course" to add a pretty diploma to the wall. The course is very comprehensive and professional, and requires diligence and considerable thought to complete. It is a true "Principles of Commercial Diving" course by *the* Master Diver, Houston Childers."

If you are a sport diver who wants to broaden his area of diving awareness, or, if you are a sport diver who would like to make a few commercial bucks on the side, or, if you are an underwater instructor who feels compelled to enlarge upon his total diving know-how, then this course is for you. And, if you are a sport diver who is undecided about whether or not to go into commercial diving, this could be the answer. The knowledge obtained from the course will be practical in any aspect of diving, but it can also be the deciding factor as to whether you wish to go on to a complete diving school. If you do decide to go on, you will already have the work half done.

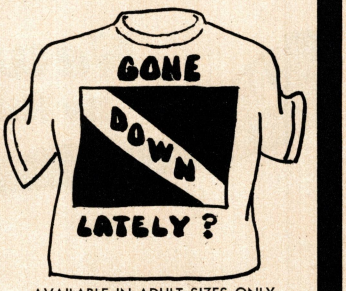
No one ever says it, but one of the most important aspects of diving is coming back up. The more you know, the better your chances for success — in accomplishment and longevity. For information: Houston Childers, UMI, Dept. A, Box 654, Spring, Tex. 77373.

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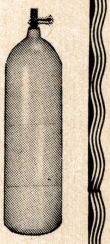
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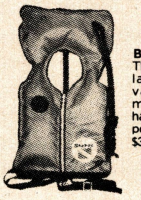
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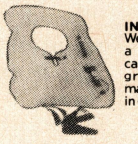
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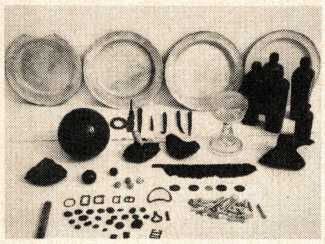
By Hillary Hauser

MONSTER, ANYONE?

In London you may soon be able to order sea monster fried, boiled or broiled. British fishery experts recently approached the minister of agriculture, fisheries and food with the suggestion that grenadiers and scabbards be used as delicacies. Both critters are spiky, bulbous-eyed predators with blotchy red skins that are found at depths between 300 and 500 fathoms (about half a mile down).

RIVER TREASURE

Quebec's Richelieu River, near Lake Champlain, was the site of naval battles during the French and Indian War, the Revolutionary War, and the War of 1812, and it has coughed up historical artifacts for three Canadian divers. A. Lepine, D. Theberge, and H. Fortin used U/W metal detectors in relatively shallow waters (35 feet maximum) to bring



up French, British and Canadian coins dating between 1749 and 1842, china, old bottles, an oil lamp, a cannonball, brass buckles, musketballs and military buttons.

NUCLEAR DISPOSAL

The Deep Sea Drilling Project (DSDP) may provide an answer to the problem of nuclear waste disposal. (The problem exists because the containers used to hold radioactive material usually erode away long before the half-life of the radioactive material is over.) The idea is that cannisters of nuclear waste could literally be inserted into holes drilled into the ocean floor.

The most ideal spots for such holes would be where tectonic plates meet, since these are the sites where subductive activity occurs — a downward sinking. The movement in these zones would theoretically push the cannisters directly down into the magma. The DSDP, in past studies and observations of plate tectonics, or continental drift, is the greatest source of information on such zones, and could identify the exact points where the plates meet.

TITANIC FANS

We've received a good amount of mail expressing interest in the Titanic Enthusiasts of America and the "Titanic Commutator" as a result of the article about a Titanic meeting in May News Briefs. If you're interested, write The Titantic Commutator, P.O. Box 53, Indian Orchard, Mass. 01051.

NEW TABLES

A research team at Texas A & M University's Moody College of marine sciences is developing improved decompression tables for diving. The team, led by Dr. Ed Beckman, is aiming toward more efficient time schedules for decompression, based in part on theories of thermodynamic and kinetic decompression recently developed by Dr. Brian Hill of London.

SUB STATUS

The National Transportation Safety Board has been reviewing the Coast Guard report on the Johnson-Sea-Link accident all summer, and hopes to have the project completed this month.

TUITION CUT

Sea Research Society (So. Carolina) recently announced that tuition for its new College of Marine Arts has been temporarily cut from $1500 to $500 per four-month semester. Students enrolling under the plan will be able to continue their education at the cut rate. Future SRS projects include the salvage of the tiny Civil War submarine *H.L. Hunley*, which sank the *USS Housatonic* during the war, and the raising of the Civil War gunboat *USS Dai Ching*, which was sunk by Confederate forces in the Combahee River, So. Carolina. At present, SRS students are at work salvaging the Confederate cruiser *Georgiana*, sunk off Charleston March 19, 1863, by the Federal Blockade.

PORPOISE PROTEST

A public furor has developed over a proposed change in the Federal Marine Mammal Protection Act that would allow commercial fishermen to buy a $5 permit to kill porpoises that "endanger the fisherman's gear, catch, or life." The fishermen must first try to frighten the animal away.

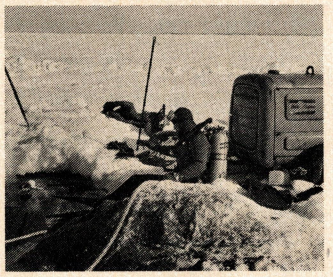
Under the Act, commercial fishermen were given two years to develop fishing methods and gear that would let trapped porpoises escape (see News Briefs, August) and the two year period ends next month. The $5 permit is seen as an extension of the grace period since current technology is not 100 percent reliable although new nets and fishing methods have significantly reduced porpoise kills. The $5 permit is seen as a license to kill, and many organizations have protested loudly. "If this change is allowed it will wreak havoc with our efforts to protect the porpoise," says Maj. Joe Brown, chief enforcement officer for the Florida Marine Patrol.

1000 FT. ON 10%

Duke University has taken their 1000 foot tests one more jump up the ladder. (See News Briefs, Jan., May, for previous Duke tests.) On April 23, five divers, under the supervision of Dr. Peter B. Bennett, went to 1000 feet breathing a tri-mix (nitrogen, helium, oxygen), with the nitrogen content reduced to 10 percent. During the last tri-mix dive to 1000 feet the nitrogen content was 18 percent, which negated the effects of HPNS (High Pressure Nervous Syndrome), but mild narcosis was experienced by some of the divers. On the 10 percent mix, the five divers felt no dizziness, tremors or sickness — and no narcotic effects. They stayed two hours on the bottom performing tests (one diver worked 40 minutes assembling a large steel flange), and they decompressed in four days — considerably faster than Navy schedules. Bennett says that he would like to find the breakthrough point of HPNS, and thinks even lower nitrogen percentages could be tried (like five percent). For possible future tests Bennett would like to 1) see how long divers can stay and work efficiently while breathing the tri-mix, and 2) try using other narcotic gases in deep diving operations, and 3) experiment with lower levels of oxygen for decompression. The Duke tests were funded by the Harbor Branch Foundation (Fla.), with Oceaneering Intl. supplying divers and equipment.

ORE UNDER ICE

Three years ago a truck loaded with 20 tons of silver ore worth $17,000 (then) went to the bottom of Hottah Lake, about 100 miles from the Arctic Coast near Great Bear Lake, Canada. Today the ore is worth about $56,000. Two divers from Yellowknife, N.W.T., Canada, have salvaged half the ore from the truck at 80 feet by using a rather ingenious, but costly, method. The two, Wayne Gzowski and George Pieper of Arctic Divers (N.B. Feb.) chopped their way through five feet of ice, set up a pumping system and sucked the ore to the surface. (The silver



powder was in sacks, each sack weighing one ton.) The divers stayed four and a half weeks on the site, where above-water temperatures averaged 45 degrees below and water temperatures were 32 to 33 degrees. Warm weather began to melt winter roads, which ended the expedition, so next year Gzowski and Pieper will return for the other half.

Gzowski speculates that this could be the first time ore has ever been salvaged by using suction at a depth of 80 feet, through ice that's five feet thick, in temperatures 45 degrees below. We wouldn't go out of our way to dispute it.

GOLDEN SUB

A German submarine recently discovered near Singapore may contain more than one million dollars worth of gold. The sub has already yielded a substantial amount of mercury. An Australian salvage company plans to raise the two halves of the sub from 180 feet of water and an Australian film outfit will document the salvage attempt.

ELMER'S BONES

During the summer of 1973 Dale Elmer, who operates an arts and crafts shop in Provincetown, Mass., found a dead minke whale in Cape Cod Bay. Elmer received permission from Truro police to claim the whale carcass and began the lengthy and smelly process of cleaning the whale for display outside his establishment.

Soon he learned that he faced a possible $5000 fine by NOAA because he had violated the Marine Mammal Protection Act of 1972. On June 25, several NOAA officers seized the whale bones, but Elmer continued to maintain his claim over them. While the box of bones sat for six months in the Provincetown post office a tug of war ensued. Investigating government agents said the bones should have gone to the Smithsonian for their scientific value, but the Smithsonian wanted no part of it until the matter was legally settled.

NOAA agents threatened to confiscate all marine mammal artifacts within Elmer's possession (including those obtained prior to enactment of the marine mammal law) if he did not drop claim to his skeleton. Elmer was reportedly perplexed over the fact that during the time the hassle raged over his bones, several other dead whales had beached in the area but were bulldozed under by municipal officials. In the end, Dale Elmer relinquished all claims to his box of whale bones, and the NMFS withdrew threats of fines and prosecution. Elmer can now apply under the Marine Mammal Protection Act for a permit to acquire another whale carcass that washes ashore, and he says he will do just that.

ARCTIC FIRSTS: BLACK HOLES, POLE DIVE . . . AND COMICS

Canadian newspapers recently carried a five-part syndicated comic strip series revolving around the MacInnis Arctic diving expeditions. The regular comic feature *Frontiers of Science* entitled the five-part series "Diving Under the Ice."

Meanwhile, several noteworthy events were reported during the Arctic IV expedition, which took place April 25 to June 19 this year:

1) In April, Dr. Joe MacInnis and four assistants made what is believed to be the first successful dive under the ice at the North Pole. The men planted Canadian flags over and under the ice.

2) What may be the longest Arctic dive ever made took place under five foot thick ice in Resolute Bay in May. Two divers, Jim English of St. John's, Newfoundland, and Bob Wicklund, of the Bahamas, spent 24 hours at 15 feet. 18 hours were spent in an U/W station (SPID), which was heated to about 70 degrees. During the other six hours the two performed U/W experiments outside the station.

During the dive Wicklund and English discovered "black holes," in which sea animals can't live. Oxygen probes showed practically no oxygen in the pools, and many dead fish, clams and other animals and plants were found near the holes. The largest hole was 13 ft. by 17 ft. and was filled with a black sediment. Wicklund speculated that the holes were caused by poor circulation of water under the ice, allowing pools of low-oxygen water to form in the depressions.

The two also discovered U/W icicles hanging from the underside of the ice. The icicle formations measured up to 6-8 feet and were hollow, as if they had frozen from the outside in. Some of the icicles contained small shrimps, which were living inside.

6500 MILE NOTE

Almost two years ago three youths from the Los Angeles area sent a message adrift in a bottle in the Los Angeles Channel as they returned from a weekend at Catalina Island. 490 days later, on Feb. 17, 1974, Jack Ball, who was on a scientific expedition on Eniwetok Island to study turtles, found the bottle and he wrote to the trio about his find. Eniwetok is about 1060 miles southeast of Guam, and quick calculations revealed that the message had traveled about 6500 miles.

ODDS & ENDS

Dr. Edgar End, who pioneered the use of helium-oxygen mix for deep diving, was presented with the Behnke Award of the Undersea Medical Society on May 10 . . . The Natl. Audubon Society has granted $35,000 to Mote Marine Lab to study the effect of pesticides on Florida's disappearing brown pelicans . . . The Piceans dive club of Newton, Mass., recently cleaned Crystal Lake of debris, with the help of the local Red Cross and Sea Scouts . . . Two Australian divers say they have found the 3202 ton Australian hospital ship *Centaur* in 180 feet of water 40 miles east of Brisbane. (Navy authorities say the ship, which was torpedoed by Japan 31 years ago, sank in about 400 feet of water) . . . SJR 184 (Senate Joint Resolution) has been introduced by U.S. Senators Magnuson, Pell and Hollings calling for government action to stop Japan and Russia from hunting existing species of whales into extinction . . . The Virginia Mason Research Center (Seattle) has developed a wrist-worn decompression meter called the Borom-Johnson Decompression Meter . . . Puget Sound may be a research sanctuary for killer whales. NOAA is studying the possibility under authority granted by the Marine Protection, Research and Sanctuaries Act of 1972.

READERS ARE INVITED TO SEND ITEMS TO NEWS BRIEFS EDITOR HILLARY HAUSER, 8490 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA 90069

The Coney

(Cephalopholis fulva)

Throughout the years the serranid family of sea basses and groupers have been a great source of ichthyological perplexity. Many serranids can change color at will to match their surroundings, some go through color phases as they mature, and some species may have individuals that are of entirely different colors. Not only that, serranids change sexes, most of them starting out as females and switching into males in later life. Some of them are even male and female at the same time (hermaphroditic) and could go through the whole business of having babies single-handedly, although most of the hermaphrodites choose to spawn with others. ☐ The coney is one of the serranids that can cause the biggest amounts of confusion. The range of colors it can exhibit is spectacular when considered next to most fishes which are stuck with one color scheme only. The most common color phase of the coney is a reddish brown, but it can come in a pale cream color, a green, or brown. One common form is sharply bicolor—with the upper part of the fish a dark color and the lower section almost white. The dividing line is at the level of the eye. Ichthyologists James Bohlke and Charles Chaplin indicate that this is the "excitement phase," thought to occur when the fish is frightened or excited over the prospects of food. However, the scientists have observed this phase as a long-term phenomenon, and Dr. John Randall states that the bicolor form is the common phase seen underwater. Then there's the golden yellow phase, which one ichthyologist reports as "rare," but diver observations have indicated this phase as being relatively common. ☐ In spite of all these variations on a color theme, there are definite markings that separate the coney from its look-alikes. These are 1) the blue, white or black spots that always appear over the head and most of the body, blue being the most common color of the spots; 2) the two black spots on the base of the tail, one behind the other; and 3) the two dark spots on the lower lip. These markings are found on all coneys no matter what the overall color is. ☐ Whether the color variations are caused by environment or the process of aging is not fully answered by ichthyologists, but it is known that coney individuals found in deeper water are generally a darker red-brown than those found in shallower inshore areas. The shallow, inshore forms are often the two-color phase. The coney is found from depths of a few feet to 500 feet and is quite common throughout the tropical western Atlantic (primarily the West Indies), off Bermuda, the Bahamas (Great Bahama and Little Bahama Banks), So. Florida to southeastern Brazil, including the Gulf of Mexico. It generally stays close to the bottom, cruising the reefs in search of crustaceans and fish, its primary diet. ☐ The coney grows to one foot only while its grouper relatives reach much larger sizes. It is known as a good food fish and is commonly caught on hook and line. It may sense that it's a "wanted" fish because it is rather unfriendly by nature. Because of this, photographers will find the coney a rather difficult fish to approach underwater.



(Bicolor Phase)

Photo By Carl Roessler-Text By Hillary Hauser

Photograph taken in 50 feet of water off Curacao, Netherlands Antilles. Roessler used a Nikon F camera with a 55mm lens, a Hydro strobe, Kodachrome II, 1/60 at f11, 18 inches from subject.



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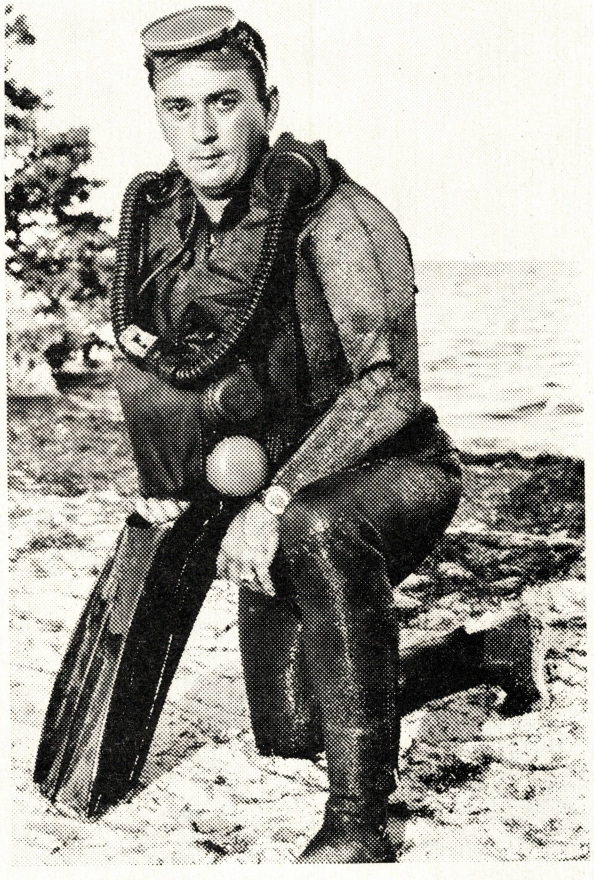
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SCUBAPOKER

(Continued from Page 45)

I swam back to the beach where delighted squeals of laughter were coming from the crowd of spectators as they watched the colorful buoys dance around on the surface. Many teams fell wide of their marks, the telltale buoys making the errors in navigation glaringly obvious. This contest was quite different than others I had attended. The most important difference was that it was possible for the spectators on the beach to watch the progress of each team. It was a very pleasant way to spend an afternoon, basking in the sun, sipping refreshments and watching the buoys weaving this way and that on the sea.

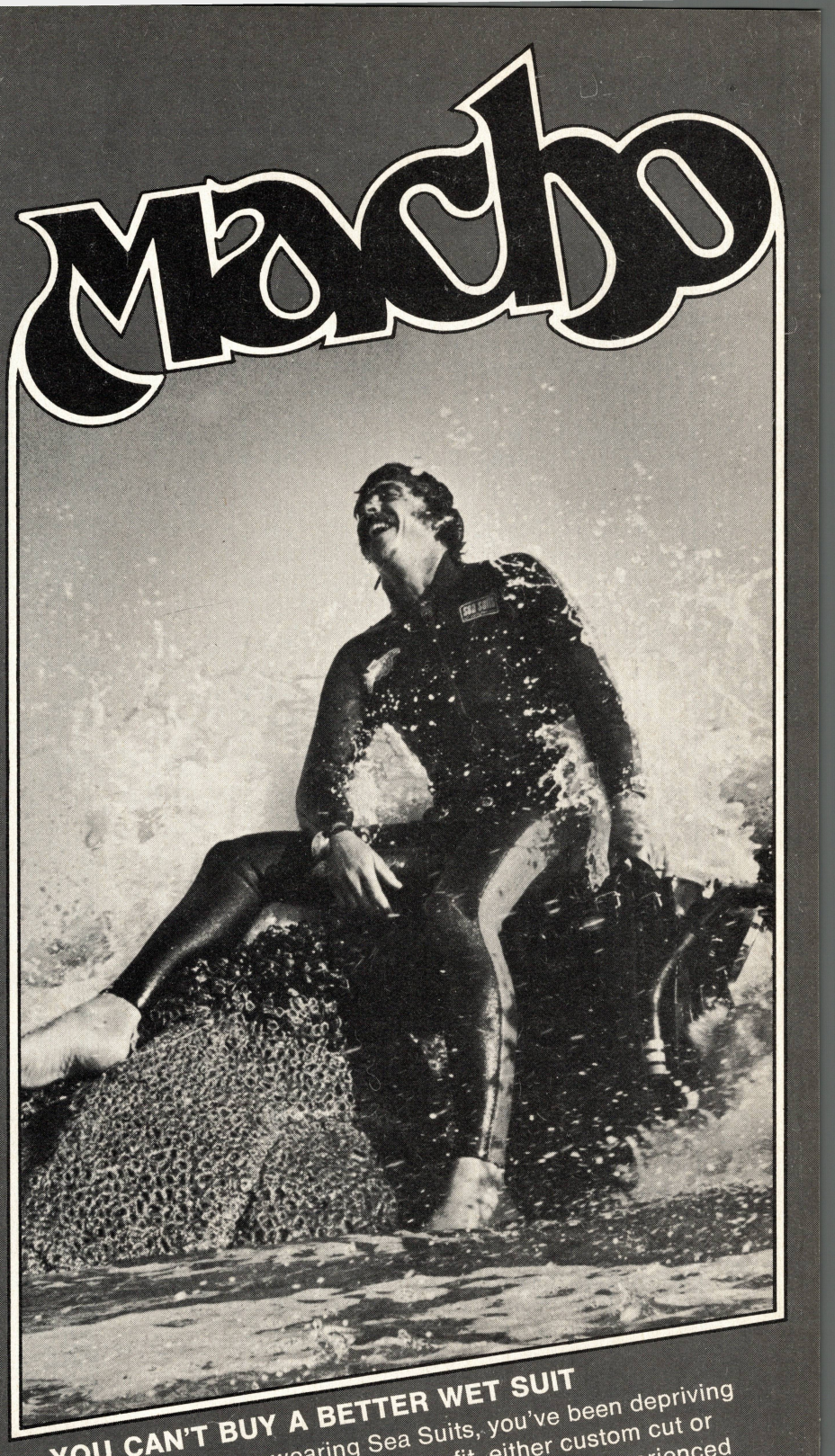
This tournament certainly was a far cry from spearfishing competitions. Although unquestionably a type of contest necessitating a high degree of skill and conditioning, a spearfishing competition utilizes the ability of each team to spear fish in order to determine the winners. The Scubapoker contest also measures the skill of the diver teams, but in an entirely different way.

Certainly attractive is the prize money in the Scubapoker contests. A diver may enter as many local contests as he wishes, meaning that a good team might win several contests at a local level. At the regional level the rewards are much higher, and at the national level, higher still. The winning team in this year's Scubapoker finals will win several thousand dollars! As an even further reward, the winners of the regional and national contests will receive diving vacations to all parts of the globe!

Check with your local diving store to find out the time and location of the next Scubapoker contest. You must register at an NASDS store, and you must be nationally certified. This contest may find you a winner! There are a lot of things one could do with that much money. You might even want to go to Vegas and get in a poker game.



"I'm sure there's a regulator here somewhere."



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Logical Fallacies of the Spearfishing Controversy

By Bill Barada

The spearfishing controversy now raging through the ranks of skin divers is certainly nothing new. The pros and cons have been argued since the sport was called "goggle fishing," and most of us old-timers have been up to our face masks in the squabble since we landed our first fish back in the 1930s.

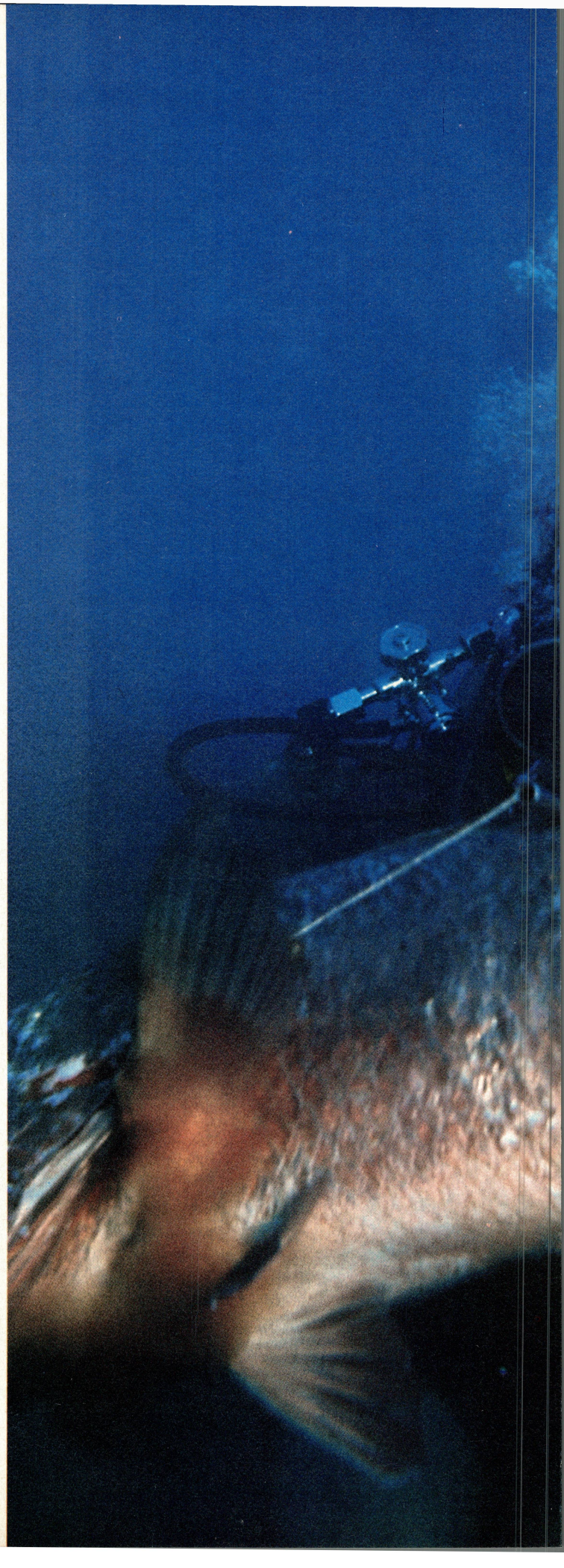
It would seem that, since thousands of divers have debated the subject for more than 30 years, we would have exhausted all of the arguments and reached some conclusions that all of us can live with. Apparently this is not the case. The same old contentions — and the same accusations and justifications —that were rampant 30 years ago are appearing today, and they are just as divisive now as they were then.

If past history is repeated, the dissension created by the present spearfishing fight will seriously hurt the entire diving community. Historically, as antagonists and protagonists choose up sides, accusations fly in every direction, emotionalism runs high, personality conflicts among influential leaders become involved, organizations outside of diving are brought in, and legal actions supported by political power plays are initiated which are often detrimental to all types of diving.

As a veteran of hundreds of such donnybrooks, I am convinced that the entire controversy is based on a logical fallacy which has led to the misconceptions and confusion that pervade arguments on both sides of the issue. It seems obvious to me that, since practically all other underwater activities have been accepted without question, the unending hubbub over spearfishing must be due to a basic flaw in our attempts to evaluate and interpret the true nature of the sport. This logical fallacy, I am absolutely convinced, is comparing fish hunting with rod and reel fishing and ignoring the fact that the impact of a spearfisherman on marine life is that of an underwater hunter, not a fisherman.

There is no question that the number of fish killed by skin divers is insignificant when compared to the catch of rod and reel or commercial fishing. This was proved beyond any shadow of a doubt in intensive research by the California Department of Fish and Game. Not only was the total number of fish taken by spearfishing insignificant; based on individual man-hours of effort, spearfishing proved least efficient.

However, this is about as relevant to the controversy as trying to compare duck hunting with trout fishing. When a skin diver goes underwater with a speargun he is not fishing. He is hunting. The only thing he has in common with fishing is that his target has fins and scales instead of fur or feathers. And the impact of underwater hunting on the fish of a reef is very similar to the impact of hunting on animals in a forest. Both fish and animals soon become "gun shy" and rapidly depart the area under stress. A few of the larger, more sluggish species of fish which are permanent residents of a reef and are slow to



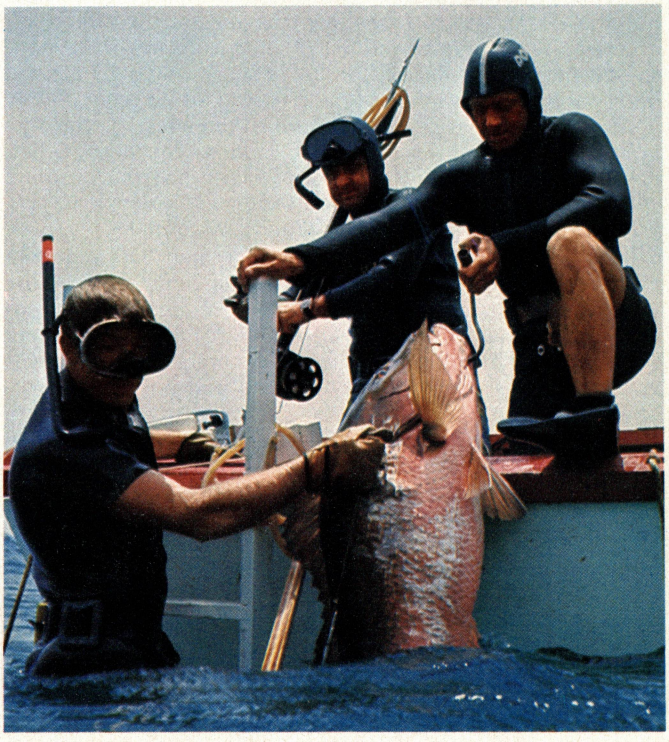
reproduce can be decimated by fish hunters. But most species are more prolific than rabbits and the possibility of depleting these populations with a speargun is very remote.

There is also no question, however, that constant pressure from spearfishing drives the desirable fish away from an area or makes them so skittish they are rarely seen by the average diver. Any old-timer fortunate enough to have been the first to explore a virgin reef can testify that fish are not naturally afraid of skin divers. In the early days of diving off southern California, big sheepshead, calico bass and buttermouth perch followed us around like dogs.

Today, these southern California fish are so spear-wise that some divers claim they recognize different types of guns and stay out of range of a particular brand. At any rate, these once curious, friendly fish have now learned that divers are a deadly enemy and they duck out of sight at the sound of approaching flippers or air bubbles. Consequently, the reefs and kelp beds that swarmed with big fish now appear barren.

This pattern has been repeated in popular diving areas all over the world. I was among the first group of divers ever to visit Guaymas, Mexico. Off San Carlos Point, jewfish and grouper weighing from 50 to 500 pounds were lying all over the bottom in less than 20 feet of water. I counted 12 jewfish in my range of vision on a single breath-hold dive. These fish were almost as tame as hogs, and I am sure that with a little time and effort they could have been converted into pets. Today Guaymas is a popular spearfishing spot and in order to see one of these fish a diver must adopt the tactics of a professional hunter. For the sight-seeing diver the fish do not exist.

Wherever you go the story is the same. If spearfishing is permitted, the fish disappear. Only in protected areas such as John Pennekamp Coral Reef State Park where spearfishing is not permitted can you sometimes find big fish that are not afraid of divers. But even here poachers often spoil the enjoyment for everybody else. Steve Klem and I had a pet 40 pound grouper that came out each day to greet us and get its handout



photography by Author

Only the novice diver, and competition diver, shoots fish he does not want. An experienced diver selects his quarry as carefully as a deer hunter and he would prefer to come in with an empty stringer than to shoot fish unworthy of his skill.

of food. This ended when a group of poaching spearfishermen killed our pet. As a result, other fish which had been spectators were so badly frightened they also disappeared.

The effect of spearfishing on fish behavior cannot be brushed aside by arguments that these animals are accustomed to being hunted by natural predators and that a skin diver has no more impact than another fish. Natural predators do not hunt all day, every day of the week. They feed only when they are hungry. At other times their victims are given a rest. This is why we often see predators and prey swimming peacefully in close proximity to each other. Where spearfishing is practiced the fish quickly learn they are in constant danger whenever a diver is in the water. On a popular reef the fish are never given a rest and most seek safety by hiding out or heading for less dangerous living quarters.

The fish are still around and can be taken by rod and reel fishing because even frightened fish must continue to forage for food and lines can be set in water deep enough to catch them. Wary fish can also be found and shot by highly skilled and experienced spearfishermen who know where and how to hunt them. The entire content of my book (*Underwater Hunting*, Doubleday, 1969) is devoted to discussing some of the tricks and techniques used by experts to find and capture wary game in oceans, lakes and rivers. The book also explains in detail why the average diver seldom even sees a spear-wise fish. They are alerted by the slightest sound, or the pressure wave from flippers and disappear long before they are in range of a diver's vision.

This is why spearfishermen who defend the sport by comparing the number of fish they kill with the tonnage taken by sport and commercial fishing are simply blowing meaningless bubbles and wasting precious air. The fact that skin divers kill an insignificant number of fish is little consolation to non-spearfishermen because fish hunting scares the bejeezus out of fish and destroys much of the pleasure for all other divers.

This, I believe, is the true nature of the spearfishing controversy. It is a conflict of interests among skin divers which has little or nothing to do with conservation. The real problem which must be faced is that a minority of divers are denying others the right to enjoy fish in their natural environment.

In America an activity is usually regulated only when its practice interferes with the rights of others. Since spearfishing interferes with the rights of scientists, underwater photographers, fish-watchers, sight-seeing tourist divers, and other kinds of divers, it will eventually be regulated. The question is, will these regulations be self-imposed and enforced by organized diving, similar to instruction and safety regulations—or will they be imposed and enforced by bureaucrats as the result of legislation?

Organized diving can no longer evade this basic issue by hiding behind a smoke screen of comparisons with line fishing or by yelling "discrimination" every time spearfishing is banned in an area of ocean or a lake. They must recognize that their activity is in conflict with the legitimate interests of a majority of other *divers*, not fishermen—and the majority will no longer tolerate discrimination against their activity in favor of spearfishing. I am convinced that, if spearfishermen continue to ignore the rights of other divers and fail to regulate their sport in a manner that recognizes these rights, the decision will be taken out of their hands and *all* spearfishing may be banned.

There is no need to outlaw all spearfishing any more than there is a need to outlaw all hunting, but only when the sport is evaluated as underwater hunting does regulation begin to make a little sense. Game management practices such as open and closed seasons, protected reserves, and controlled hunting of carefully selected species, have increased the populations of most birds and animals and improved hunting conditions on land. Spearfishing, as a sport in which the hunter picks his target, can be managed in much the same manner.

The establishment of open and closed spearfishing seasons in alternating areas will give the fish a respite from constant attack, attract wary species into the area, and improve the quality of both spearfishing and diving in all coastal waters. The establishment of more reserve areas where spearfishing is not permitted will eliminate the conflict with non-spearfishermen.

Equally important, spearfishermen must adopt and promote the attitude of hunters instead of fishermen. This means the rules of good sportsmanship and conservation advocated by hunters must be applied to spearfishing. Only the novice hunter bangs away at crows, birds and beer cans when he is hunting big game. And only a novice diver bangs away at small perch, rays, and similar targets. The experienced hunter selects his weapon to suit the game he is after and prefers to return empty-handed rather than bring in a specimen unworthy of his skill.

In actual practice, most experienced spearfishermen follow this policy of good sportsmanship. Divers hunting white sea bass off Catalina Island do not waste time and energy shooting at opaleye perch or sheepshead; hunters after striped bass on the East Coast do not bother with flounder, and the diver who shoots angelfish, parrotfish and similar beauties of coral reefs is immediately branded as a novice.

Unfortunately, spearfishing competition rules do not permit an attitude of hunting only for trophies or food. The early contests established the winners as the team of divers which could kill the most fish based on total weight of the catch, and some of the most vicious spearfishing battles have been over these rules. The antagonists were neither pro nor anti spearfishing. All of us hunted fish. The fight was centered around the fact that most-fish or most-weight contests do not represent an accurate picture of the sport as it is actually practiced.

Many antagonists contended that the spearfishing competition rules forced competitors to shoot fish they did not want and would normally pass by. They said that measuring a diver's ability by the number of fish he could bring in gave a false impression of spearfishing and encouraged non-competitors to follow this example. Also, a contest to see who can kill the most fish cannot be justified to conservationists any more than a contest to see who can kill the most deer or antelope can be justified. The fact that the meat is donated as food to a worthy cause does not change the fact that a diver's ability is judged by the number of fish he can kill.

Other antagonists insisted that competitions must be determined by skill, not luck, and that the rules must eliminate the possibility of a diver winning by "lucking into" a particularly big fish. This concept prevailed and, although competition rules have been refined into a complex point system which places different values on different species, these original objections are still valid. Fewer points per pound are awarded for exceptionally large fish and usually on larger species in order to balance the impact of their size on total weight and reduce the factor of luck or chance. Thus today's spearfishing competition rules give a false image of spearfishing in terms of underwater hunting and do not represent the true nature of the sport as it is actually practiced even by champion competitors.

Bill Ernst, a spearfishing champion, puts it very clearly in his statement, "Spearfishing is a tough, demanding sport that happens to involve spearing fish . . . Since this is an international sport, much of my time is spent conditioning my body. This year I went to Spain, with the U.S. Team, to free dive 60 to



A diver underwater with a speargun is hunting, not fishing, and only the novice or competition diver bangs away at small-fry unworthy of his skill. The spearfisherman's effect on fish populations is similar to that of a hunter in a forest, and the art of hunting cannot be compared to commercial or sport fishing at all.



100 feet deep and try to spear fish. Before this tournament I was riding a bicycle 40 to 50 miles per day to build up my cardiovascular system to endure the two consecutive six-hour competition days. Weight lifting was concentrated in the chest area to enable me to inhale a larger breath. As a team we practiced repetitive free dives to 100 feet off Bird Rock, Catalina. All this conditioning did not involve any fish. And this is where most of my time is spent when I practice 'spearfishing'." He goes on to say, "I like seafood and since I'm in the U.S. Army it is a good way to cut food costs. The only time I spear fish that I don't eat is during competition meets."

I have a tremendous admiration for competition divers such as Bill Ernst, and have written glowing accounts of their prowess in numerous books and articles. Their dedication to their sport, the skills they display and the feats they perform are nothing short of incredible. This admiration, however, is for an athlete who represents a unique sport which is practiced only by those divers and diving organizations which eat, sleep and breathe competitive diving.

I believe it is unfortunate that competitions as now practiced do not reflect the type of underwater hunting advocated by these men and women when they are not engaged in a contest. Perhaps if they did, or if they developed competitions that did not involve spearing fish, their unique sport would appeal to a much wider segment of the skin diving fraternity. As things now stand, it is a logical fallacy to expect competitive spearfishing to attract support from other divers, including noncompetitive spearfishermen. They do not represent the best interests of the majority of U.S. skin divers.

The impact of competitive spearfishing goes far beyond the handful of divers who actually enter the contests. In the heyday of free diving and spearfishing the local, national and world champions were looked upon as heroes by the clubs and councils which comprise organized diving. They were respected as leaders and their interests often influenced club members to the point that competitions dominated all club and council activities and meetings. In fact, since only members of a bona fide diving club could compete in regional and national tournaments, many clubs were formed solely for the purpose of entering teams in competitions. Also, because competitive spearfishing required a dedicated national and international organization, the competitions were often the glue that held organized diving together.

To a certain extent this still holds true in many sections of the country and it may account for the decline in membership and popularity of many diving clubs and councils. Clubs which spend most of their time organizing and running competitions have little to offer a non-competitive diver. And the deterioration of many clubs seems to coincide with the decline in popularity of spearfishing and the increase in popularity of other underwater activities.

Thus, I believe the time has come for an agonizing reappraisal of competitive diving as it relates to everyday spearfishing and the rights of other divers. Perhaps my old friend Gustav Dalla Valle is right that competition has served its purpose and should be eliminated (SDM March, 1974). However, this small handful of divers have more at stake in preserving the sport of spearfishing than all others. They know more about spearfishing and have more skill than any other group.

I believe spearfishermen have the leadership and organizational ability to influence the course of events today as they did in the past. Perhaps it is the competitive spearfishermen who should lead the way in establishing the rules, regulations and management practices that are needed to bring about a change in attitude toward spearfishing. This can only be accomplished by adopting and promoting the concept of underwater hunting. Continuing with the logical fallacy that they are simply engaged in a different method of fishing is, I believe, the road to self-destruction.

I believe most of us will support a diver's right to hunt fish and other underwater game for food as long as his activity does not interfere to any great extent with the rights of others. But we cannot support or justify his right to kill fish, or any animals, just for sport.

BAHAMAS PHOTO TREASURE HUNT



The first Bahamas Underwater Photographic Treasure Hunt will be held from November 10-17. It is open to all certified divers, but will be limited to the first 100 divers whose applications are received. The hunt will be conducted at each of six diving resorts in the Bahamas. They include the Andros Beach Hotel, Andros; Romora Bay Club, Harbour Island; Small Hope Bay Lodge; Andros; Spanish Isles Resort, Spanish Wells; Stella Maris Inn, Long Island; and the Underwater Explorers Club, Freeport.

The rules of the treasure hunt are as follows: 1) Each diver will be given one roll of 35mm Ektachrome-X, 36 exposures. 2) Each diver will be given a list of 35 underwater subjects to photograph. 3) The diver at each resort who photographs the largest number of subjects on the list will be named the winner. In cases of ties, the quality of the photography will determine the winner at that resort. 4) The winners at each resort will compete in a similar one-day "playoff" in Nassau. All divers will dive from one boat. 5) The overall winner will be chosen from this group by a panel of judges, whose decision is final. There will be no appeals. 6) The first frame in each roll of film should be a picture of the diver's name and resort written on a blackboard or piece of cardboard. 7) The contest is open only to certified divers. 8) The entry fee of $25 is payable with the entry form. 9) The entry fee will include the cost of film and processing, cocktail parties and awards banquet.

After the first three days of the treasure hunt in the dive resorts, the scene will shift to Nassau where a cocktail party has been arranged for Thursday, Nov. 14, at which some awards will be presented. The Bahamas Dive Club will organize a party for Friday evening, and a gala awards banquet and cocktail party will be held Saturday, Nov. 16.

Divers are expected to bring their own regulators, life vests, cameras and personal equipment. Some resorts supply full equipment. Special package rates are available at all the resorts, and special diving rates will be in effect at Nassau for those wishing to dive Thursday, Friday or Saturday of the contest week.

Prizes will include first place cash of $1000, second place, $500, and third place $250. Additionally, the winners at each resort will win a week's dive trip for two at one of the other resorts.

Address inquiries or registration to: Bahamas Underwater Photo Treasure Hunt, Suite 904, 200 S.E. 1st Street, Miami, Florida 33131.



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TOBAGO'S
FABULOUS FLYING REEFS

By Paul Tzimoulis

Located in the southeast corner of the Caribbean, just off the coast of Venezuela, is the beautiful West Indian island of Tobago. Twenty-six miles long and seven miles wide, this mountainous, tropical piece of real estate represents one of the few remaining outposts of paradise. Barely 30,000 people live on Tobago, scattered across the island in small villages and employed in agricultural endeavors. Among the produce grown there are bananas, cashew nuts, coffee, mangos, limes and a wide variety of other tropical fruits. Although Tobago is only 20 miles from the bustling commercial trade center of Trinidad, it still remains isolated from the outside world.

Until recently, few sport divers had ever heard of Tobago, let alone dived its crystaline water. There were few hotels there, and even less diving equipment. The once beautiful, but now overrated Buccoo Reef was all but destroyed by a hurricane less than 10 years ago. And most of Tobago's really fine reefs and good diving are situated at the opposite end of the island, far from the airport and resort hotels. Fortunately for Tobago, and sport diving alike, a brand new diving lodge and scuba facility have recently been installed at the northeast end of the island, close to some of the finest coral reefs in the West Indies. Situated in a quiet cove, close to the village of Speyside, is a group of resort bungalows snuggled under the cooling shade of a coconut palm grove. Here, one can find the most modern of scuba facilities, excellent food, and clean, casual hotel accommodations. The resort is known as the Teach/Tour Dive Lodge.

The creation and development of this new lodge is the brainchild of its owner and director, Raymond Morrow of Nazareth, Pennsylvania. Ray had been an avid New Jersey wreck diver for 17 years, and had always dreamed of someday opening a vacation resort in warm tropical waters. With the help of the Trinidad/Tobago government, and the owners of Blue Waters Inn, Ray was able to make his dream a reality by establishing the first all-service scuba facility in Tobago's history. He has installed $42,000 worth of skin diving gear, air compressors and dive boats, to make this resort operational.

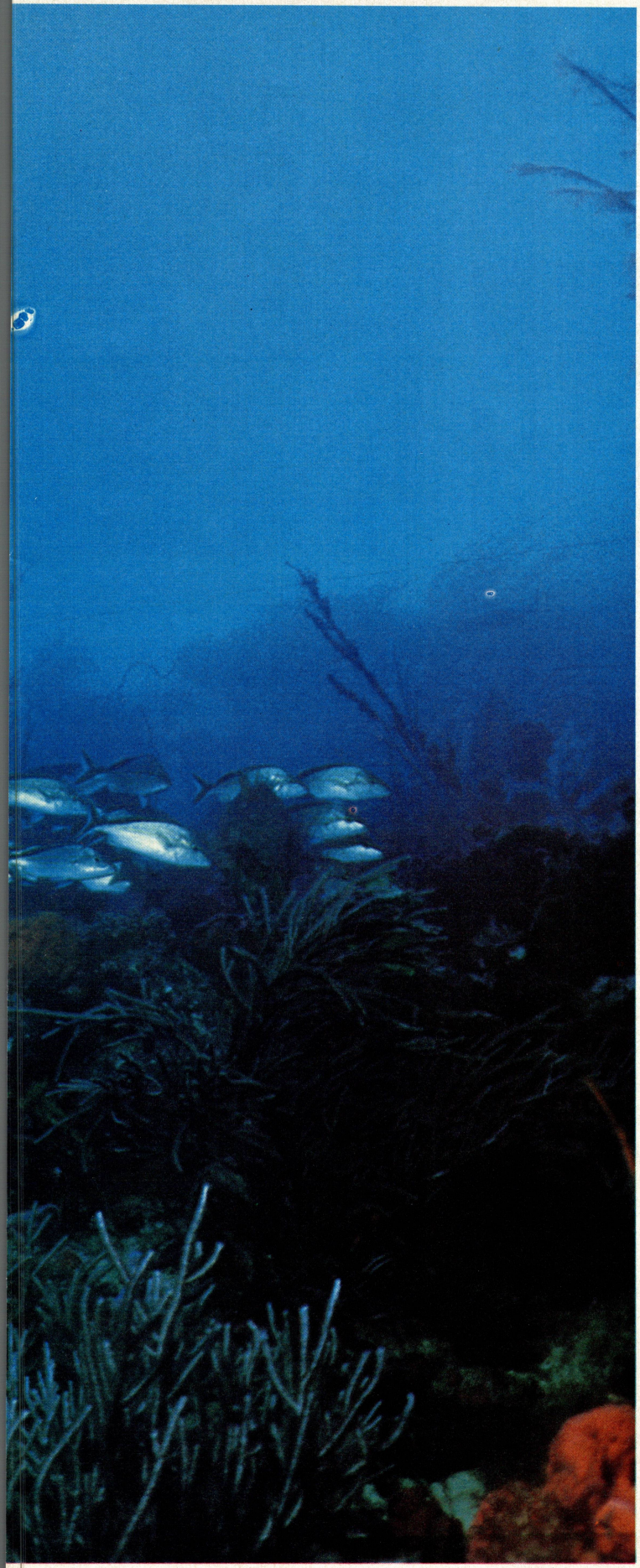
At present the Teach/Tour Diving Lodge is equipped with a 15 cfm Bauer air compressor and a cascade system of six 300 cubic foot air storage bottles. A smaller Mako air compressor is also on stand-by in case of maintenance problems. The facility has an inventory of 20 rental tanks, all of them being Dacor 80 cubic foot, 3000 psi aluminum cylinders, with another 20 tanks in reserve for larger groups. It keeps 20 Dacor rental regulators in stock, with additional equipment and inventory including 20 safety vests, 50 pairs of fins, 40 masks and 40 snorkels. The lodge is well equipped to handle dive clubs, small groups, or the individual traveler.

Two dive guides are always on hand to take people out to the reefs, and another two are on stand-by in case the pace gets especially busy. Chief guide at the lodge is Californian Peter Philp, a PADI certified instructor. There are three dive boats at





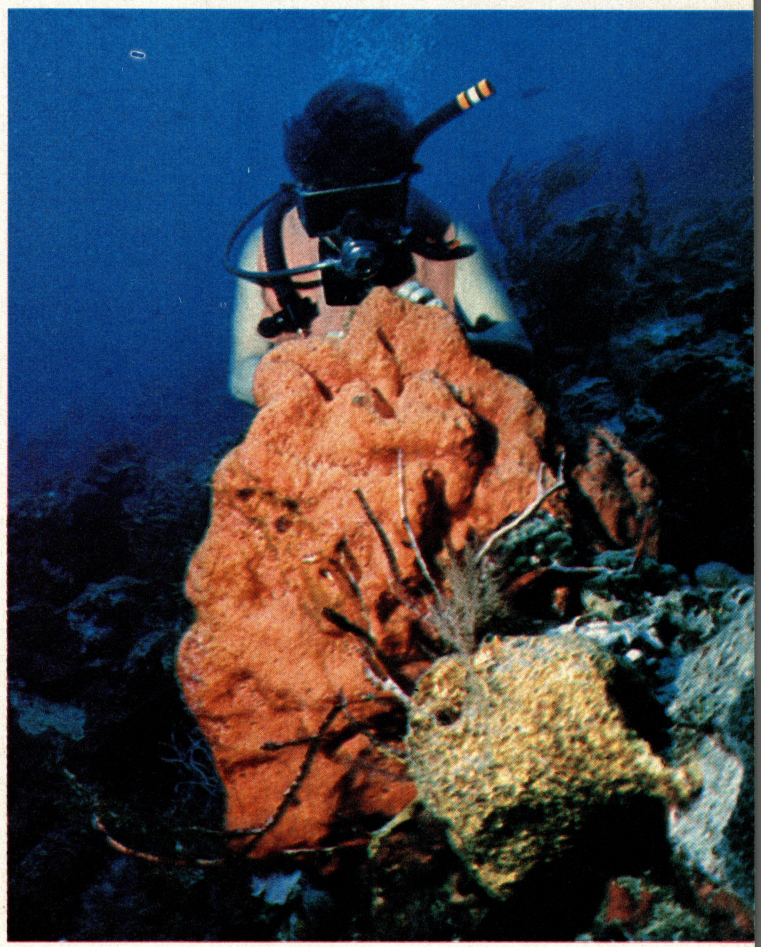




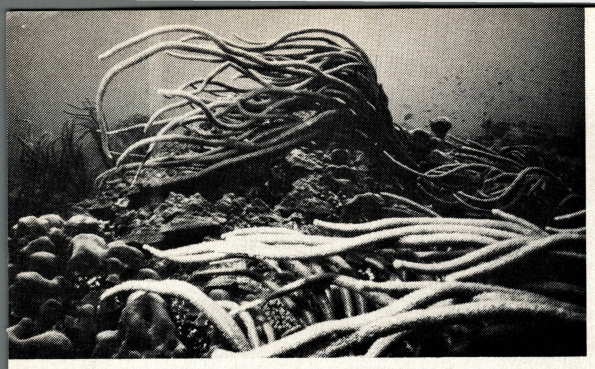
A diver approaches a school of Cottonwicks, or Black grunts, at South Point. These fish rarely stray into murky water.



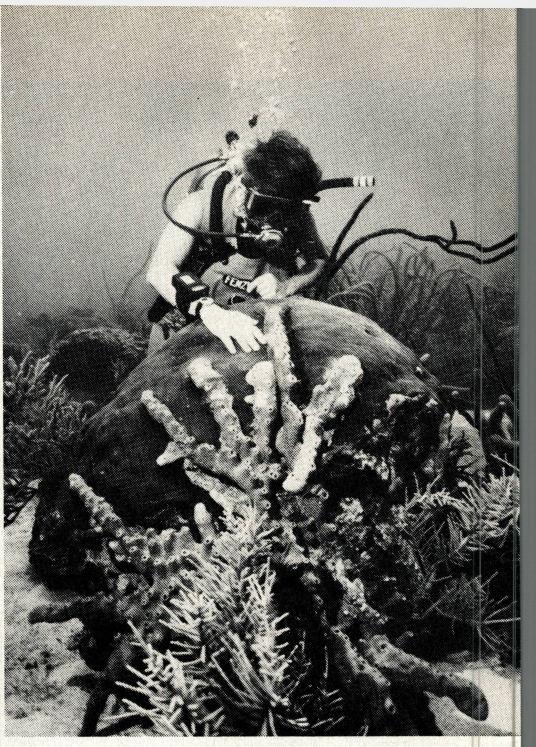
Black Forest Reef boasts kaleidoscopic diving and strange forms of sea life, such as this clam-like sponge.

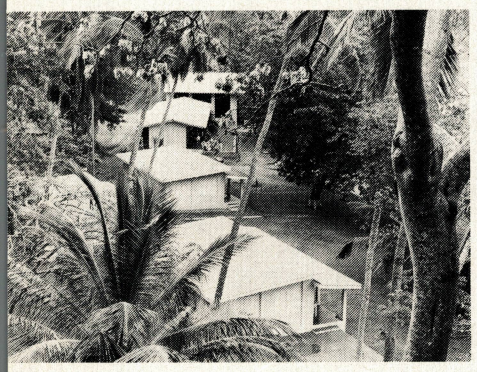


The brilliant orange and yellow sponges found on Angel Reef are willing subjects for the underwater photographer.



The Teach/Tour Dive Lodge is a group of beach bungalows snuggled under a grove of shady palms. The lodge has three boats which carry divers to some of the fantastic diving spots in the area such as South Point Reef, shown at left, and Black Forest Reef, at right with Teach/Tour guide Pete Philp examining a unique sponge formation.







Photography by Author

the lodge, two of which are 17 foot Boston Whalers powered by 70 hp Johnson engines. The third craft is a 27 foot fishing pirogue powered by a 40 hp Evinrude. The three boats have the total capacity of 22 divers.

Dive trips are scheduled twice daily, with the morning dive departing at 10 am and the afternoon at 3 pm. Night dives are scheduled twice weekly and additional dives can be arranged on request. An 8 am pre-breakfast dive has become quite popular with guests since the reef is quite active in the early morning hours.

The hotel portion of the dive lodge is made up of seven small bungalow buildings, located less than 100 feet from the water's edge. You can drift off to sleep to the sound of gentle surf slapping against the beach. There are a total of 12 rooms and sufficient beds to accommodate 20 diving guests. A constant trade wind keeps the temperature comfortable and there is little need for air conditioning.

The dining room and bar area are open-air style and located in the largest of the buildings with two sides open to the sea. Meals are served family-style with generous portions for the hungry divers' appetites. The grounds surrounding the hotel are especially well manicured, with large grassy lawns and graceful palms adding a tranquil touch to this idyllic setting. There is a tennis court, a shuffleboard court and a Ping-Pong table for after-dive recreation. The lodge is definitely a beach-style hotel with very casual atmosphere. There is little need for dressy clothes, for the general dress for the day is swim suit, shorts or dungarees. The entire setting is small and seductive.

Diving at the Teach/Tour Dive Lodge is considerably different from the style usually found in most Caribbean islands. Since the lodge is located on the windward side of the island, the sight of whitecaps and rolling swells is quite common. There is nothing between Tobago and the coast of Africa except for 3000 miles of open Atlantic ocean. Fortunately, two small offshore islands (Goat Island and Little Tobago) form a protective barrier for the dive lodge. Most of the diving is done on the lee side of these islands.

The reefs there are especially beautiful and wholesome because they are constantly fed by clean, fresh oceanic water. An abundant supply of nutrients are brought into the reefs by strong currents which flow between and around the offshore islands. Marine life is prolific, the water very clear and the currents often strong.

Due to the water conditions, the Teach/Tour Dive Lodge at Speyside is recommended for the experienced diver who can handle himself in moderately rough waters. It is not for beginners and tourists, and they would be far better off taking their basic scuba lessons at the Crown Reef on the lee side of Tobago. But for the diver who seeks hearty adventure and healthy reefs, this resort is ideal. Diving conditions are not quite as rugged as the average diving conditions off the Jersey coast or California, but there is surf, surge and swells.

At this time, the Teach/Tour Dive Resort offers a selection of ten dive spots, with more being found every month. Present locations span a wide variety of undersea interests including ancient anchors and shipwrecks, forests of black coral, manta rays, schools of fish, colorful sponge formations and fantastic coral reefs. The following is just a small sampling of the most popular dive locations which are visited almost daily.

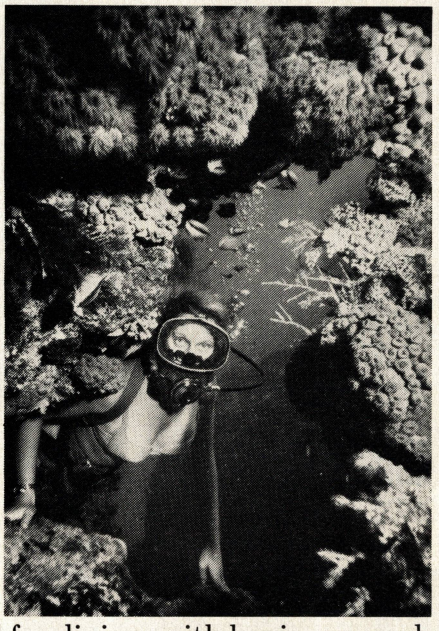
ANGEL REEF — This lovely dive site is on the leeward side of Goat Island, an island one-half mile directly out from the diving lodge. The dive site is located just about in the center of the island, 75 yards off the only white house on the island. The top of this reef is 19 or 20 feet deep, and is covered with a lovely variety of sea fans, gorgonians, sea plumes and many other sea garden varieties. One large brain coral measuring six feet in diameter dominates the scene.

The reef gets its name from the great number of angelfish which live on this reef. There are two large queen angelfish and four big French angelfish which immediately swim up and greet the divers entering the water. These angelfish are extremely friendly and totally unafraid of the diver's approach. You can actually feed these fish by hand. They are especially fond of the purple and orange encrusting sponge which grows on the underside of coral rubble and rocks lying about the bottom. You find a handy sized rock, turn it over, and hold it up for the angelfish to feed.

If you want to attract a variety of different fish, chop up a

(Continued on Page 73)

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Have fun reefing. Explore the fantastic coral forest in the deep. If all you want to do is laze on a crescent beach under a coconut tree, that's apples*, too. Because you'll soon be cruising to other reefs in the Great Barrier, on a ship equipped for diving, with beginners and experts for mates, and a crew that will give you the true griff* on every inch of our tropic seas. You may even cruise as far as the Saumarez Reef off the coast of Queensland. There's a giant mound of coral with a wrecked ship on top, the waters are 80 degrees and tumbling with Tuna, Mackerel, Tarpon, Giant Grouper, and you can see clear down to 200 feet.

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You don't have to take just our word for it: Eastman Kodak chose Caneel Bay as one of the two locations for their brand new 27-minute sound movie, "Discovering Underwater Photography." Stan Waterman and Smokey Roberts did the underwater scenes.* And, Jack McKenney said some pretty nice things about Caneel Bay, and the Smithlines, and the diving here. See his story in the April 1973 issue of SDM. If you can't find your copy, write us and we'll send you a reprint. And, we'll send you full details on our 5 day, 4 night Scuba Plan (available to November 1) and our special group rates for 10 rooms or more (available September and October). Write to John Steinle, Rockresorts, Inc., 30 Rockefeller Plaza, New York, New York 10020.

**If you and your diving club would like to see the new Kodak film, write to: AVS Library, Kodak Office, 343 State Street, Rochester, New York 14650. Refer to: "Discovering Underwater Photography," title code 0366. You pay only return postage to Rochester.*

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GUAM SEMINAR ON DIVING MEDICINE

Guam, a fast growing scuba playground in the Pacific — was the recent scene of a scuba first — a six-hour Diving Medicine Seminar attended by 250 divers from Guam and Micronesia.

Special speaker for the seminar held at the University of Guam was Dr. A.T.K. Cockett, professor and chairman of the Division of Urology, University of Rochester (N.Y.) School of Medicine and Dentistry. A leading researcher in the causes and treatment of decompression sickness, Dr. Cockett lectured on the physiology of decompression sickness, the rational approach to and combined treatment of the sickness. Other participants in the seminar included Capt. R.E. Thompson, M.D., Lt. Samuel Strauss, M.D., Ron Strong, Mitch Warner, Ron Schanmen, John Oakes, and Dr. Steve Zuckerman.

The entire seminar was recorded on tape and cassette copies may be made available in the future for a small cost. Anyone wishing a bibliography of Dr. Cockett's publications or other information may write the Seminar Coordinator, Mrs. Dianne Strong, Marine Laboratory, Box EK Aguna, Guam 96910.

BIMINI ISLANDS

You can now enjoy a diving vacation in the Bimini Islands, Bahamas, by taking advantage of a trip offered by Atlantis Safaris. The trip lasts for eight days and seven nights and includes diving off the island of North Bimini, in the areas of Mozell Shoals and North Rock. Off the island of South Bimini, you'll dive Turtle Rocks, Picquet Rocks and the famous concrete ship which was sunk in World War I in 20 feet of water and protrudes dramatically from the water, making it a fascinating spot for both topside and underwater photography. Diving will also include Gun Cay, Honeymoon Harbour and sites off the exclusive island of Cat Cay. The highlight will be an exploratory dive on the site which many believe to be the lost city of Atlantis and others believe to be the remains of a Phoenician seaport. This site has been the subject of many interesting newspaper articles and recent television programs.

The cost of the trip, based on double occupancy, is $315 for divers and $175 for non-divers. This price includes unlimited diving in Bimini at different sites everyday, transportation to dive sites via a special diving boat, all tanks, back packs, weight belts and air, accommodations in the Bimini Islands Yacht Club, three meals a day, airport transfers in Bimini, ferry transfers between North and South Bimini and the U.S. International departure tax. For information contact: Bimini Islands Yacht Club, Box 530344, Miami, Florida 33153.

long-spine sea urchin with your dive knife. This type of offering will generally bring on a swarm of yellow wrasse, spotfin butterflyfish, Spanish hogfish, rock beauties, queen parrotfish, and other reef residents. It gets to be quite a mob scene, and one feels like the Pied Piper of the fish kingdom. Even the wary queen triggerfish venture in for a bite or two.

From 20 feet, the reef slopes downward on a 45 degree angle to a depth of 110 feet. You begin to encounter sand at 90 feet and the coral thins out into scattered clumps. The current also increases as you venture further out from shore, and you can see all of the gorgonians leaning over . . . bending with the flow. The coral slope is well covered with a variety of corals, both the soft and hard form. Dome shaped corals, brain corals, sea whips, and flowering gorgonians are most prevalent. There are tube sponges and great clumps of orange sponge everywhere you look.

Angel Reef is an especially good spot for check-out dives, scuba training, and snorkeling. The little cove is well protected from the strong flowing currents, yet offers exceptionally clear water. Visibility ranges from 80 to 150 feet.

BLACK FOREST — A large, submerged reef lies in the channel between the dive lodge and Goat Island. It is marked by two large black rocks which jut out of the water. The current there is very strong, but well worth the struggle for a magnificent forest of black coral can be found growing on the lower slope of the northeast corner of this reef.

The slope begins in 20 feet of water, slowly tapers off to 50 feet, and then slants downward to 110 feet on a 45 degree angle. This dive is a tough swim because you have to fight the current to get down the slope. Once you reach 100 feet, you must swim along the base of the reef a couple of hundred yards on a circuitous route in order to reach the forest of black coral. Although it is tiring, the effort is well worth it. Before you lies an entire slope of black coral as thick as a forest of trees! It's quite an awesome sight. The slope is well populated with large angelfish, mutton snapper, margate, and tiger grouper.

There's a large stand of elkhorn coral on top of the reef in 20 feet of water. There, the surge is noticeable and the water somewhat turbid. A large school of Bermuda chub cruise this area constantly.

In-shore of the elkhorn is a patch of rather barren coral bottom on which grow some very strange sponge formations. The sponges are practically the identical shape and size of the giant tridacna clams found in the far Pacific. They look like giant bi-valves set on end in the coral, with their mouths agape. The sponges are buff-brown in color and have a glass-hard texture. They are the strangest sponges I've ever seen.

SOUTH POINT — Located at the southern end of Goat Island, this spot is perhaps the most beautiful reef in Tobago and certainly offers the most unique dive imaginable. The reef begins close to shore at a depth of 20 feet and slopes downward steeply to a depth of 100 feet. The upper portion of the reef is a great forest of gorgonians and sea plumes which are constantly bent by the surging current. Visibility there is very clear, often ranging from 90 to 175 feet.

The lower portion of the reef is decorated with a marvelous array of giant orange sponge, large black coral trees, and brick-red gorgonian fans. Great schools of fish roam the slopes, usually hugging close to the depression and gullies in order to avoid the surging current. There is plenty of fish activity on the reef with Nassau groupers, French angelfish and Spanish mackerel constantly in sight.

The most interesting aspect of the reef is the double current situation which exists there. In the shallow waters, the current flows southward at a velocity ranging from three quarters of a knot to one and a quarter knots. As you proceed down the slope of the reef you encounter an equally strong current flowing in the opposite direction. From a depth of 100 feet to 130 feet, this current increases in power and direction. It appears that the current on the bottom is the main current and one that passes the island on a regular constant basis. The current closer to the surface is thought to be an eddy current.

A diver can actually see this entire reef with hardly a kick of his flippers by simply riding the upper current southward and then descending the slope to catch the bottom current going back to the boat. The technique is often called "flying the reef" for the diver glides over the corals like an aircraft pilot navigating above the countryside. It is an exhilarating experience and a fine way to cover a lot of ground on one dive.

South Point is generally reserved for advanced divers and a dive lodge guide is required to show guests exactly where and when to change currents. This kind of diving requires good diving skill and coolheaded thinking, for it is much faster than an ordinary drift dive. It is unquestionably one of the most unique dives in the entire Caribbean.

BATTEAUX BAY REEF — Approximately 200 feet directly out from the dive lodge beach is a small coral reef which stretches across the entrance of Batteaux Bay. This area is used for advanced scuba training and first-day equipment check-outs. The top of the reef is approximately 20 feet deep and drops off sharply to a mud/sand bottom at 55 feet. Although visibility is not as good as on the outer islands, there are a great many corals and sponges growing on this reef. Quite a number of large fish inhabit this area, including a 20 pound yellow fin grouper and several smaller groupers.

An ancient anchor is half buried in the sand at the base of the reef. No other evidence of a shipwreck can be seen, and it is thought that perhaps this artifact is left over from the old shipping days. If there is a shipwreck here it must be buried deep under the silted bottom.

Not too far from this reef are the remains of a ship known as the "Bottle Wreck." This is a favorite location for antique bottle collectors who are searching for new items.

There are a number of additional dive locations within close proximity to the Teach/Tour Dive Lodge. There is an excellent cove area on the leeward side of Little Tobago, the island which lies beyond Goat Island. On the south side of Little Tobago there are a number of underwater caves which are said to harbor some very large groupers. Another excellent shallow water coral reef can be found at Kings Bay which is three miles south of Batteaux Bay. Brisant Bay, which lies to the north of the lodge, is frequented by manta rays providing an excellent opportunity for unique underwater photographs. Good lobstering can be found in the shallow reef to the south of Bishop's Bay, less than three quarters of a mile from the hotel.

In order to promote his new dive lodge establishment, Ray Morrow has developed a very fine scuba package which includes six nights at the lodge, five days of diving, two meals a day, taxi transportation from and to the airport, and air fare from either New York, Miami or Toronto. The full package price is $389, undoubtedly a bargain considering the services.

BWIA International Airlines offers daily jet service from the United States to Trinidad, with connecting flights onward to Tobago. For more information about the Teach/Tour operation and diving Tobago, write to Ray Morrow, Teach/Tours Diving Co., 138-C Beil Ave., Nazareth, Penn. 18064.

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Sept. 2—MARISLA/SEA OF CORTEZ—7 days, Photomarine Int'l Travel, Reseda, Calif.
Sept. 6—NASSAU—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
Sept. 6, 13, 20, 27—BONAIRE—8 days, Lislind International, New York, N.Y.
Sept. 6—GREEK ISLANDS—17 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
Sept. 6—BAHAMAS—7 days, Capt. Chalker, Tropic Diving Cruises, Ft. Lauderdale, Fla.
Sept. 7—CAYMAN ISLANDS—13 days, Dewey Bergman, See & See Travel, San Francisco.
Sept. 7—BONAIRE/CURACAO—9 days, Carl Roessler, See & Sea Travel, San Francisco.
Sept. 7 — HONDURAS — 7 days, Boca Marine, Inc., Boca Raton, Fla.
Sept. 9 — COZUMEL — 7 days, Chalet Club, New York, New York.
Sept. 9—HAWAII/KONA—8 days, See & Sea Travel, San Francisco, Calif.
Sept. 11 — PUERTO RICO — 5 days, Chalet Club, New York, N.Y.
Sept. 12 — TOBAGO — 7 days, Chalet Club, New York, New York.
Sept. 13—SPANISH HONDURAS—4 days, Grand Am Int'l Tours, Ocala, Fla.
Sept. 14 — HONDURAS — 7 days, Aquatic Center, Key West, Fla.
Sept. 17—CARTAGENA, COLOMBIA—11 days, Sunland Int'l Tours, Beverly Hills, Calif.
Sept. 20—BAHAMAS—7 days, Capt. Chalker, Tropic Diving Cruises, Ft. Lauderdale, Fla.
Sept. 21 — HONDURAS — 7 days, Atlantis Diving Center, Philadelphia, Pa.
Sept. 27—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
Sept. 28 — HONDURAS—7 days, Michigan U/W Schools of Diving, Lincoln Park, Mich.
Oct. 4—MARISLA/SEA OF CORTEZ—7 days, Photomarine Int'l Travel, Reseda, Calif.
Oct. 4, 11, 18, 25—BONAIRE—8 days, Lislind International, New York, N.Y.
Oct. 4—BAHAMAS—7 days, Capt. Chalker, Tropic Diving Cruises, Ft. Lauderdale, Fla.
Oct. 5—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
Oct. 5 — HONDURAS — 7 days, USAFECO, Salt Lake City, Utah
Oct. 7—BIMINI—7 days, Capt. Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
Oct. 11—COZUMEL/AKUMAL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
Oct. 12—SPANISH HONDURAS—6 days, Grand Am Int'l Tours, Ocala, Fla.
Oct. 12—COZUMEL/YUCATAN—8 days, Van Worley, See & Sea Travel, San Francisco, Calif.
Oct. 12—BONAIRE/CURACAO—9 days, See & Sea Travel, San Francisco, Calif.
Oct. 12—ROATAN/HONDURAS—6 days, Chalet Club, New York, N.Y.
Oct. 12—GRENADINES—7 days, Windward Leeward Sailing Tours, San Francisco, Calif.
Oct. 12 — HONDURAS — 7 days, Underwater Schools of America, Fountain Valley, Ca.
Oct. 18—BAHAMAS—7 days, Capt. Chalker, Tropic Diving Cruises, Ft. Lauderdale, Fla.
Oct. 19—CAYMAN ISLANDS—8 days, Rich Bergero, See & Sea Travel, San Francisco, Calif.
Oct. 22—AUSTRALIA/CORAL SEA—17 days, Bob Hollis, See & Sea Travel, San Francisco.
Oct. 22—TRUK/PONAPE—11 days, Innerspace Adventures, Hickam, Hawaii.
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Oct. 26 — HONDURAS — 7 days, Houston Scuba Academy-West, Houston, Texas

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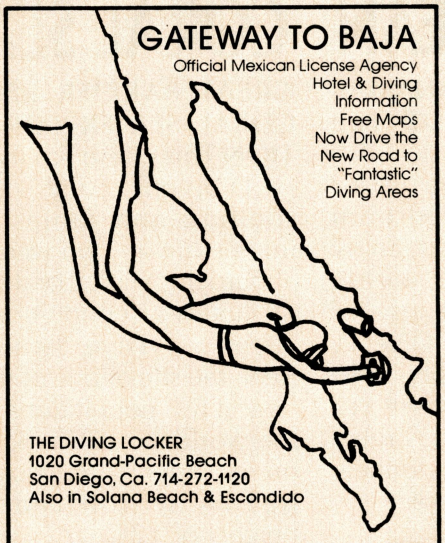
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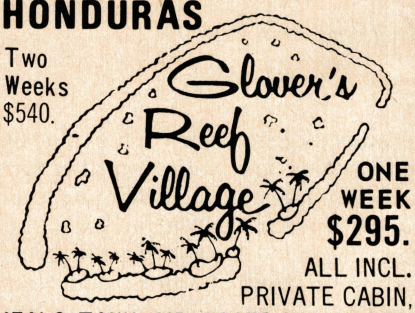
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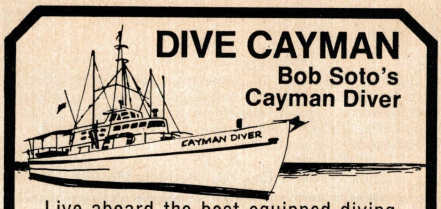
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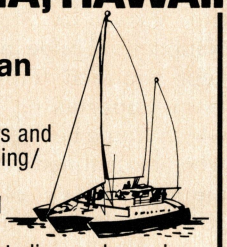
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U/W ARCHAEOLOGY

(Continued from Page 39)

derwater projects in the country. Canada and Jamaica followed soon after with stringent legislation protecting their marine sites. In the United States only five states — Texas, Florida, Massachusetts, South Carolina and North Carolina — now have similar laws protecting their offshore sites.

It is imperative that governments be alerted to the importance of not only protecting such areas from looters, but also actively supporting qualified projects. Thus far governmental assistance appears to be generally reserved for excavations involving national prestige, such as the raising and preservation of the seventeenth century Swedish warship, the *Vasa*, in Stockholm Harbor. Nationalistic pride in some countries has kept qualified foreign archaeologists from undertaking any excavations, which would be fine if they have persons who are qualified or interested in doing the job. In many places, however, the governments' refusal to allow foreigners to excavate has meant no work has been done on the sites at all.

The very accessibility of many sites in shallow water makes them vulnerable to greedy divers. If sport divers could be enlisted to participate in underwater excavation projects certainly many of them would gain far more reward than they have from random removal of artifacts. Until recently there has been a failure on the part of historians and archaeologists to communicate to the general public the significance of underwater sites. Most divers are unaware of how much damage they can do to sites by uncontrolled excavation or souvenir collecting.

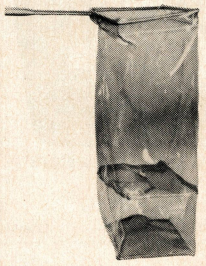
I believe most divers would rather make a contribution, even a small one, to archaeology than pick up an anchor or cannonball for display out of context. How much more exciting to research the name, history and exact fate of the wreck they are working. A few professional archaeologists have worked closely with amateurs on such excavations, and have been pleased with the results of the collaboration — but even closer cooperation on a larger scale is needed.

The British were the first to take the logical step of coordinating the activities of sport divers and professional archaeologists who for so long had been in conflict with each other. In 1963 the Committee for Nautical Archaeology was formed in London by representatives from such institutions as the British Museum, the Science Museum, the National Maritime Museum, the Institute of Archaeology and the National Institute of Oceanography. Since the establishment of this institution great progress has been made in undersea cooperation.

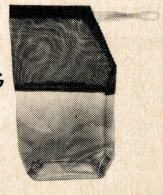
British archaeologists have begun to value the contribution devoted amateurs can make and have worked with them successfully on a number of projects. And in almost every instance in which an old wreck has been located, the British sport divers have reported their finds to the Committee, which in turn has provided assistance, both technical and financial, for the excavation of the site. In 1969 the Committee founded the School for Nautical Archaeology at Plymouth for the express purpose of teaching divers short courses in the accepted techniques they should employ on underwater sites. Unfortunately there is no comparable body in any other country.

In the United States, the Council of Underwater Archaeology was founded in 1958, but it is little more than a name. Thus far its only important contribution has been to organize a conference every

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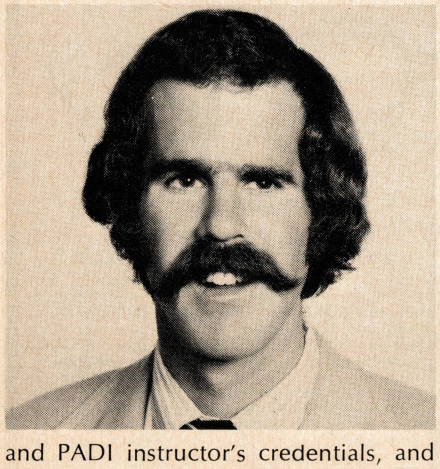
few years at which professional underwater archaeologists present papers. The Council has yet to support a single major underwater excavation or take the first step in educating divers and amateur archaeologists in the basics.

The average diver stumbling across a shipwreck or finding vestiges of a submerged place of occupation has no idea where to turn for aid in determining exactly what he has found or what to do about it. Consequently he removes a few objects to show his friends and is then labeled as a looter by the professional archaeologists. Only the five states which have legislation controlling underwater sites have state employed archaeologists who are supposed to work closely with those divers who have been granted permission by the state to work an underwater site.

There is a critical need in the United States for either the Council or a new organization, perhaps one patterned after England's, to form on a national level. The amateur diver who is given the proper guidance and supervision can achieve results every bit as interesting as can the professional.

HEALTHWAYS REP.

Healthways has announced the appointment of Bruce T. Anderson as their factory representative covering the professional dive shops in the states of Washington, Oregon and California. Bruce has been a certified diver since 1957. He holds both NAUI



and PADI instructor's credentials, and has been actively teaching scuba diving in southern California since 1969.

Anderson first went to Healthways as a design engineer. He had previously been with Hyper-Air as their operations manager. He is a native of southern California, with over 10 years experience in the diving industry.



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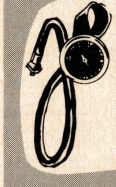
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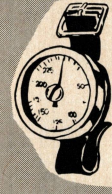


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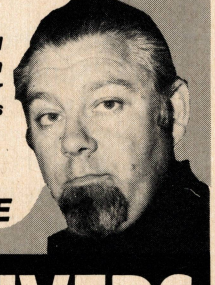
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UNDERWATER SCHOOLS OF AMERICA

Technifacts

(Continued from Page 13)

In spite of certain inherent hazards in the use of a mixed gas diving rig, from all considerations, the maximum utilization of a gas mixture requires a closed circuit system. Some of the problems of gas replenishment with depth and loss of nitrogen through leakage, or through compression with depth, have been overcome and have resulted in usable complex closed circuit scuba.

Basically a complex closed circuit scuba is a mixed gas rig utilizing either an extra cylinder of air or cylinders containing nitrogen or helium that can be metered into the breathing bag as required. The exact requirements (the gas and percentages) will depend on the depth of the dive, the required duration of the dive, and the tolerance to increased oxygen partial pressure for a given depth.

Normally the physical senses and automatic reactions of the diver can not be relied upon to warn him of a decreasing oxygen supply if other gases are present in the breathing system that permit a full breath of gas from the breathing bag. It therefore becomes necessary for the unit to maintain the proper proportion of gases through automatic metering systems equipped with adequate safety factors to warn the diver of failure of his oxygen supply.

Two methods have been developed to meet the above requirements. One is an automatic mixing valve which varies the rate of flow from two gas cylinders, one oxygen, the other air or nitrogen or possibly helium. Such a rig was the Krasberg unit under development with J. H. Emerson Co. In 1963 Emerson Co. stated, ". . . of particular note in the successful testing to 170 feet of a prototype automatic, completely closed circuit mixed gas Scubalung designed by Alan Krasberg in conjunction with J. H. Emerson Company." There was also an article on this unit in an issue of *Popular Mechanics* several years ago. I have received no additional information on this unit. Perhaps Technifacts readers can supply the latest on the unit.

Another method of overcoming the problem of adequate oxygen in a mixed gas closed circuit system was developed by Dr. Walter Starck. This system was eventually refined and marketed by Beckman Instrument Company as the Electrolung. It uses electronic controlled oxygen sensors to meter adequate oxygen to the diver. According to Beckman Instrument Co., ". . . the Electrolung II underwater breathing apparatus is a

(Continued on Page 86)

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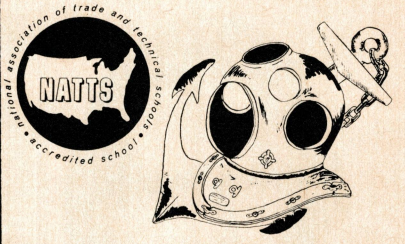
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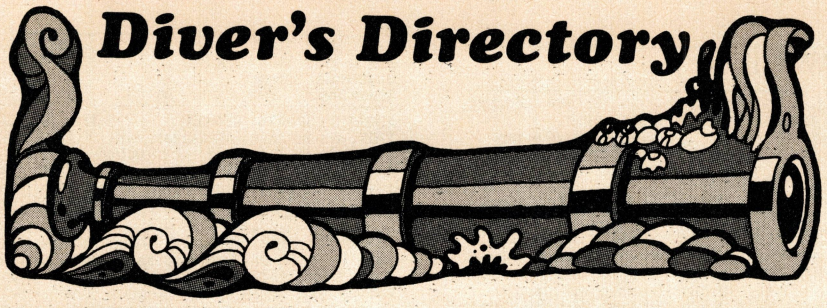
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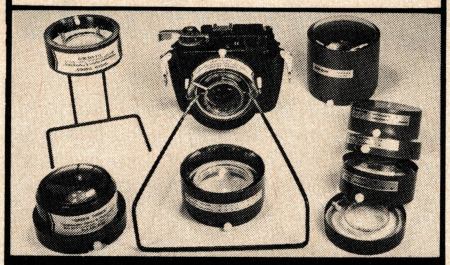
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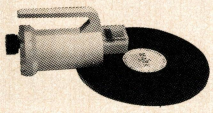
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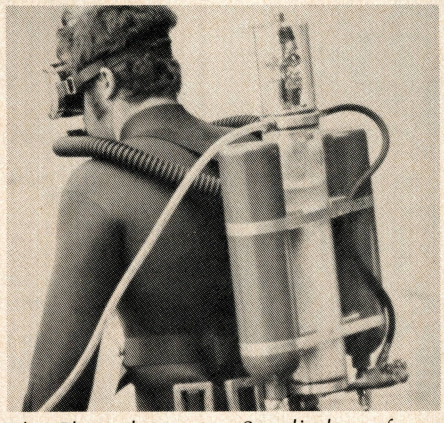
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Technifacts

(Continued from Page 80)

closed circuit, mixed gas, self contained system capable of supplying gas to a free swimming diver for as long as six hours at any physiologically safe depth, even as deep as 1000 feet. This reliable, closed circuit system removes carbon dioxide and adds fixed, safe amounts of oxygen automatically. The oxygen sensing system is triply redundant and it also contains manual bypasses which will override the automatic features if necessary."

The Electrolung uses two cylinders of gas. One contains pure oxygen; the other a diluent gas. For diving to depths of not more than 150 feet the diluent gas is compressed air. For deeper divers, from 150 to 300 feet, a mixture of 50 percent helium and 50 percent air is used; and for dives deeper than 300 feet the recommended diluent gas is 90 percent helium and 10 percent oxygen. In keeping this unit simple, and simplicity is usually safety: the only automatic units in the Electrolung are the oxygen feed, the readout of oxygen level, and the audible warning signal indicating a sensor error in reading oxygen levels.



The Electrolung uses 2 cylinders of gas.

The oxygen sensors used in the Electrolung are improved models of those developed for use in Mercury space flight programs. Similar oxygen sensors are in use, or have been used, in other space missions and in many submersibles and numerous commercial deep diving missions. The sensors read oxygen directly in terms of partial pressure, and control feeding more oxygen into the system whenever the rig's oxygen level reaches 50 percent of one atmosphere of oxygen partial pressure. Since the unit does operate on the partial pressure level of oxygen, the absolute percentage of oxygen at any given depth is adjusted automatically.

Then, as the diver's body uses oxygen, the sensors automatically feed more oxygen into the breathing system. The CO^2 is, at the same time, absorbed by the ab-

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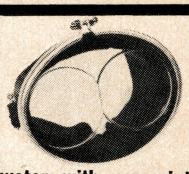
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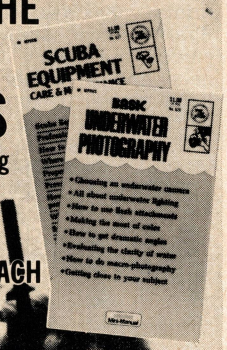
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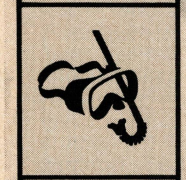
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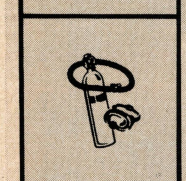
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sorbent system. In the event of failure of the sensing system the diver can either manually adjust oxygen flow into the unit or manually allow free flow of the mixed gas, air or heliox mix, into the bag and breathing system while he ascends to decompression levels.

The Electrolung is a complex but completely proven unit. Many are in use but only by well trained divers. While the unit was available to divers each person purchasing a unit had to complete a special 48 hour training course offered only by specially franchised dealers.

It is interesting to note that at least one sport diver has duplicated the complete functioning principle of the Electrolung. This Technifacts reader wrote, ". . . in the St. Louis area my brother and I have started somewhat of a trend in the manufacture and use of closed circuit mixed gas rebreathers. In fact in the general area of St. Louis there are three working units with two more in the process of being built. After beginning work (on the design) in earnest, we completed our first model of a closed circuit, mixed gas rebreather in just two weeks. The factors that enabled us to accomplish this were that my brother had completed special diving courses in the army and had considerable electronic knowledge. Also I had the shop facilities at the university available."

Since the construction of their first models, other improved units have been built with more sophisticated electronics, including an electronic digital readout using seven segment light emitting diodes. The various models of these units have been used in quarry diving and in cave diving.

Decompression for closed circuit scuba — Normally no decompression is required for closed circuit scuba that uses pure oxygen for the breathing gas. There are two reasons for this. Dives using pure oxygen cannot be deep enough to involve decompression due to oxygen toxicity. Also the body uses up enough of the oxygen so that the amount going into solution is not great enough, as compared with nitrogen in air, to cause bubble formation on ascent.

The use of a mixed gas system presents a different set of conditions. But it is relatively simple to compute decompression for a mixed gas dive, even though it may not seem so. One Technifacts reader wrote asking, "Since the Electrolung computes its own air mixture at various depths, what type decompression tables are used with this unit?" This is typical of the confusion that exists about decompression and mixed gas diving.

The first point of confusion is that the Electrolung, or any unit, can "compute its own air mixture." All these units do is provide oxygen to the diver in the proper amount. The diluent gas must be pre-

(Continued on Page 90)

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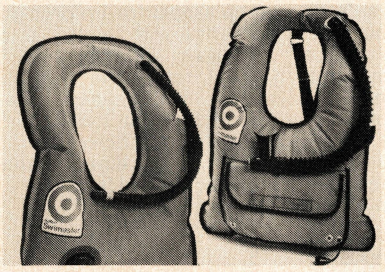
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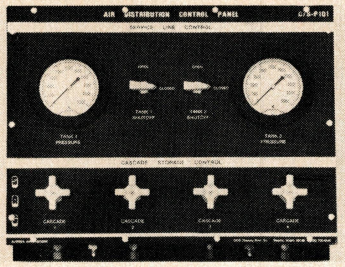
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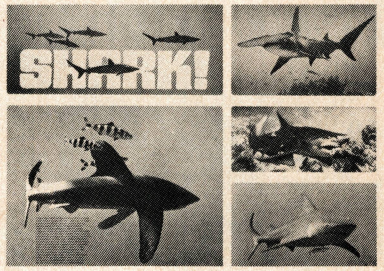
AMF Swimaster has two new buoyancy compensator vests available now: a double-bag pillow type style, and a shorty BCV design. The larger vest, which costs $75, provides 27 pounds positive buoyancy and features three dimensional double bag construction for maximum protection. The shorty vest, $33.95, provides 22 pounds positive buoyancy. Contact: AMF Swimaster, 3801 So. Harbor Blvd., Santa Ana, California.



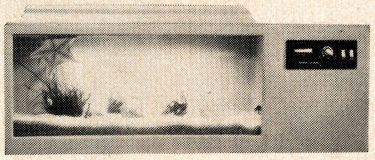


The C/S P101 air distribution control panel provides complete control of any air compressor and cascade system output: from compressor to cascade storage banks, cascade storage banks to scuba tanks, and from compressor to scuba tanks. This unit fills two scuba tanks at one time, each being controlled and monitored individually. Contact: Subsea Air Systems, 3816 Cheasty Blvd., South, Seattle, Washington 98108.

Sea Posters, by Jerry Greenberg, now come as a complete collector's set of four 18 x 24 inch full color prints. Besides the spectacular Shark poster shown, the set includes the Living Coral, Reef Angels, and a Pennekamp Park Map. Each poster is printed on coated stock and sells for $10 per set. Individual copies are available at dive shops. Contact: Seahawk Press, 6840 SW 92nd St., Miami, Florida 33156.



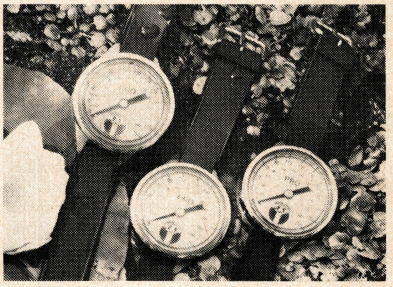
Pacific General has come out with a new totally enclosed refrigerated aquarium for home, school or laboratory use. The sides and bottom of the aquarium are made of one piece of heavy fiberglass with a marine green porcelain-like finish, and the front is plate glass for easy cleaning. Available in sizes from 7 to 100 gallons, priced from $49 up. Contact: Pacific General, 621 Old County Road, San Carlos, Calif. 94070.



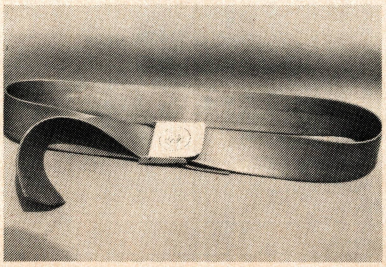


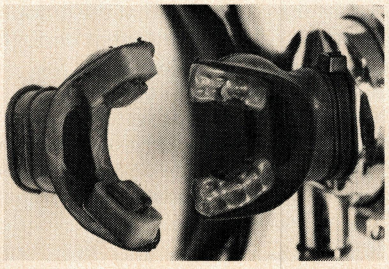
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The Pro depth gauges are the top of U.S. Divers' gauge line. Re-designed for 1974, these gauges offer a low profile and durable, non-corrosive stainless steel case. Oil filled moving lens principle for rugged dependability. Measures depth accurately to 250 feet. Available with a silver or orange face for $49.95; with a luminous face for $51.95. Contact: U.S. Divers Co., 3323 West Warner Ave., Santa Ana, California 92702.



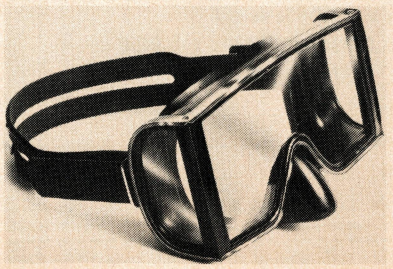
The NEO WB 100 is another of the unique products that have been added to the growing Seatec line of diving equipment. This two inch wide weight belt, with a stainless steel quick release buckle, is extruded from a specially compounded 50 Durometer neoprene which allows the belt to automatically contract in comfort as the diver's depth increases. $7.50. Contact: Seatec, 425 W. Palmyra, Orange, Calif. 92666.





Farallon has a new Moldable Mouthpiece for regulators designed to cut down jaw fatigue while diving. It has two thermoplastic inserts on the bite-pegs of the mouthpiece that become soft when subjected to a continuous source of heat, such as boiling water. By biting into the mouthpiece, while it's still soft, the diver gets a custom fit that is truly unique. $3.95. Contact: Farallon, 1333 Old County Rd., Belmont, Ca.

Nothing is more important for a diver than to have a mask which fits comfortably and seals well. Scubapro's Compact Supervision mask was designed with double sealing edge specifically to accommodate small and narrow faces. It features minimal displacement combined with maximum peripheral vision (180 degrees). This mask is $19 with a purge valve. Contact: Scubapro, 3105 E. Harcourt, Compton, Calif.



The Squeeze

An M. D. discusses the causes, cures, and prevention of a common diving injury.

By Dr. Mort Walker

Because well over a million diving enthusiasts use scuba each year, physicians are being called upon to treat a number of injuries related to the sport. The source of at least 50 percent of medical complaints in diving is the middle ear after it has been subjected to a problem which divers commonly call "the squeeze."

Middle ear squeeze occurs on descent when the air inside the middle ear contracts. This contraction on body space walls causes ear enclosure rupture for two reasons: vacuum suction from within, and ambient pressure from without. A diver doesn't have to descend very far to suffer the painful feeling of squeeze. He can develop ear pain at about ten feet from the surface, and experience dizziness and some hearing loss afterward.

Writing in *Emergency Medicine Magazine*, William L. Orris, M.D., director of medical services at the Scripps Institution of Oceanography, University of California at San Diego, described some of the pathology seen and treatment rendered in connection with middle ear squeeze. According to Dr. Orris, when the injured diver's physician looks inside the middle ear with an instrument, the doctor can see an eardrum that appears red and retracted so that the knobby portions of the ear bones protrude as bulges in the soft tissues. The eustachian tubes may be blocked by inflammation, infection, or enlarged adenoids or tonsils.

Occasionally a diver will spit blood, or he may hear a noise such as ringing, buzzing, roaring or clicking. (These sounds are real and may even be heard by his companions. The noises come from a condition of catarrhal otitis media.) Bloody sputum and tinnitis noises could be signs of eardrum rupture caused by an implosion upon descent, or an explosion caused by a spontaneous closure of the eustachian tube after a diver has taken a breath at depth and ascends. A ruptured eardrum can produce a temporary total hearing loss too, with some mechanical damage of the ear ossicles or oval or round window membranes.

The physician can mend these troubles by opening the closed eustachian tubes with decongestants. If the ear tubes don't respond to this, then the doctor may start treating the potentially more serious inner ear damage with histamine, nicotinic acid, anticholinergics, anticoagulants or decongestants. Dr. Orris suggests that the physician might have his patient inhale a mixture of 5 percent carbon dioxide, 85 percent oxygen, and 10 percent nitrogen for 15 minutes, three times a day to dilate cerebral vessels.

A diver can prevent middle ear squeeze from happening to him by thinking about Boyle's law which states that the greatest pressure changes take place within a few feet of the surface. The diver simply must not ignore sudden ear or sinus pain and keep right on descending to make eardrum rupture inevitable. He should visualize instead, that when his ear vent is blocked by an acute cold or chronic sinusitis, he's slated for trouble. Blockage will create a negative pressure within the closed cavity as the diver descends. Air will "constrict" inside the cavity and attempt to occupy less space. Or, as he descends, the blocked cavity will create a positive pressure and the air within will try to expand and blow out the membranes. Thus, bleeding from a rupture or mechanical damage can result.

On the other hand, Boyle's law takes pressure changes during scuba diving into account. The law dictates that when you change the ambient pressure of one atmosphere on the surface of the earth to something else, you're going to be subjecting your tissues and body spaces to stress. Your tissues maintain equilibrium with nitrogen by osmotic gas exchange. Your body spaces, such as the middle ear, equalize pressure through vents to the outside. The eustachian tube is the vent for the middle ear. Only if your eustachian tubes remain unblocked can you dive free and easy.

In order to avoid ear squeeze trouble altogether, then, don't dive with any kind of nasal or ear congestion. But if you must chance it, take the precaution of using a spray decongestant beforehand. Oxymetazoline under Schering Corporation's brand name Afrin, or pseudoephedrine under Burroughs Wellcome's brand Sudafed, are good for decongesting blocked body vents.

Under the surface, as you go deeper, test your ability to hear by covering one ear and producing an outside noise near the other. Ascending from depth too fast increases the chance for eardrum explosion, so if you have ear or nasal congestion double the time you spend in your usual rate of rise to 60 feet per 120 seconds. And, if you experience an ear problem after a dive, get to a physician right away — preferably an ear, nose and throat specialist or an aquamedic.



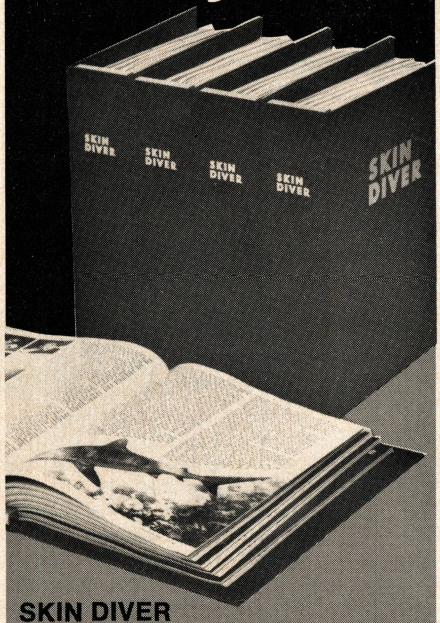
Almost five years ago Mort Walker left a highly successful professional career as a practicing doctor of podiatric medicine after winning every research and writing award that profession had to offer. At the age of 40, he set out to do what makes him most happy, professional freelance writing in two special areas of interest: medicine and oceanology. He is editor of the monthly newsletter of the New York chapter of the *American Medical Writers Association*, an active participant in the Society of Magazine Writers, instructor in writing fiction and non-fiction at the University of Connecticut, and medical ghostwriter for physicians, dentists, health professionals in other fields, as well as pharmaceutical companies.

What gives him the most pleasure is leading scuba diving tours, having adventurous experiences, and writing articles about them.

Dr. Walker is the author of three published books on health subjects. He writes brochure materials for travel agencies, and his wife participates with him in his water-oriented trips around the Caribbean. His three sons often dive with him. Mort Walker is listed as a "Diving Doctor" by *Emergency Medicine Magazine*.



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Technifacts

(Continued from Page 87)

determined and mixed by the diver depending on depth, duration of the dive and other factors.

In all mixed gas recirculating scuba two or more cylinders of gas are used. One of these contains oxygen. The other(s) contain the mixed (diluent) gases having a constant percentage of the gases they contain. In general the cylinder containing the pure oxygen is used to meter oxygen as required by the diver. As the body uses oxygen more oxygen is metered, manually or automatically, from the oxygen cylinder. The other gases in the second cylinder serve primarily as a diluent for the oxygen and are released from the cylinder as required to compensate for various diving factors such as change of depth. But the percentage of gases in the diluent mix remains constant. It is for this constant diluent gas mix that decompression for a dive must be computed.

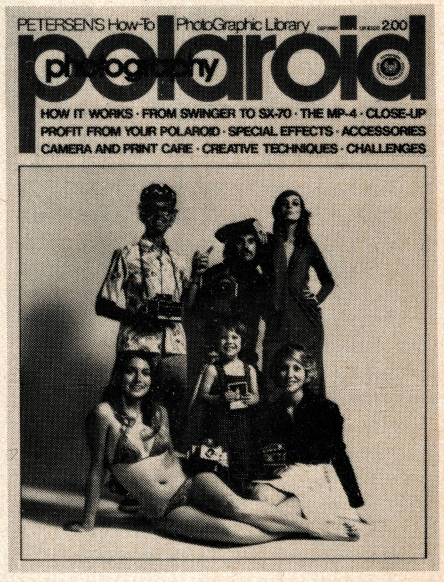
The percentages of the gases in the diluent mix must, of course, be known because the decompression will be based on the partial pressure of the inert gas in the mixture. For example, if compressed air were used for the diluent gas (as is recommended for the Electrolung for dives of 150 feet or less) air decompression tables would be used. If any mixture of nitrogen and oxygen, other than air, were used it would be necessary to determine the equivalent air depth for the actual depth of the dive. As an example, in a dive to an actual depth of 65 feet with a diluent gas being 40 percent nitrogen and 60 percent oxygen, the equivalent air depth is only 30 feet and no decompression would be required. For an actual dive to a depth of 75 feet, still using the 60-40 oxygen mix, the equivalent air depth is 50 feet and standard air decompression tables, including repetitive dive tables, would be entered for a 50 foot dive.

In using a helium-oxygen mix as the diluent gas slightly different procedures are required for decompression. For a mix of 68 percent helium, 32 percent oxygen, a decompression table is provided in the *U.S. Navy Diving Manual*. This may be used for this mix only.

For other mixtures of helium-oxygen, the helium-oxygen partial pressure for each dive from a depth of 40 feet to 380 feet is given in Table 1-22 of the Navy Manual. Enter this table for the particular mix in use (oxygen percentage) and for the depth. With this information the partial pressure is obtained and the proper decompression schedule is obtained from Table 1-23.

The diver should keep in mind that the decompression tables listed in the *U.S. Navy Diving Manual* for mixed gas div-

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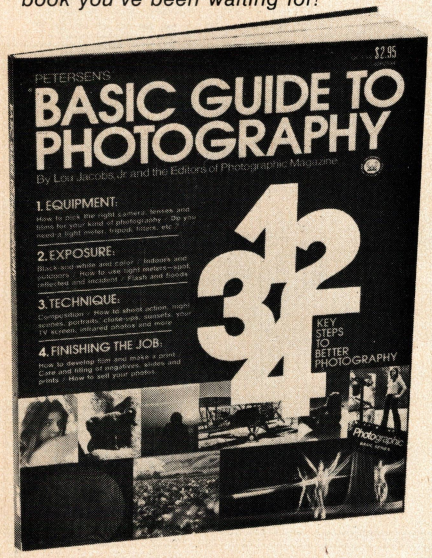
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ing are for certain specific percentages of gases. Any deviation from these percentages can cause considerable error to be present in the diver's calculations for decompression. It is therefore obvious that one of the most important aspects of safe mixed gas diving is to be able to determine the actual percentages of various gases in the breathing mixture. If a gas cannot be obtained from a supplier of compressed gases that is exactly as prescribed in the various tables, the gas mixture that was obtained would have to be analyzed and the tables entered for that gas mixture.

At present, information on mixed gas diving, including decompression tables for such diving, is available only in the *U.S. Navy Diving Manual* and from numerous technical publications. Commercial diving companies who have developed deep diving systems and procedures have not made their work public for many reasons. First, development of successful special diving procedures for deep diving give them a competitive advantage over similar companies who do not have this special knowledge. Secondly, they realize such information could lead to use of the information by persons not qualified to attempt diving with mixed gas systems.

Unless the average sport diver has a background and technical skill in the use of these systems, they should not be used. At best they require expensive support equipment and personnel since most of them (the decompression schedules and procedures) require the final stages be given using pure oxygen.

Next month's Technifacts will answer questions concerning semi-closed circuit scuba and carbon dioxide absorbing chemicals.

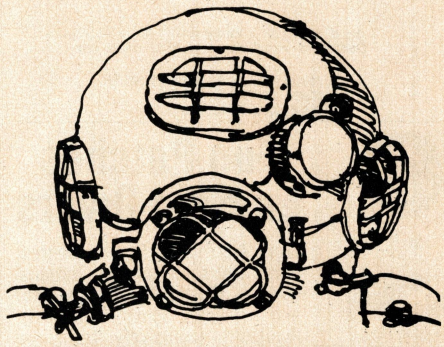
THE NORDIC DIVER

The Nordic Diver, A Journal of Underwater History, is a new newspaper published by Nordic Underwater Enterprises dealing with the shipwrecks of the Great Lakes. It will come out six times a year, and the subscription rate will be $3 per year.

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For more information contact: Nordic Underwater Enterprises, 2125 Hammond Ave., Superior, Wisconsin 54880.

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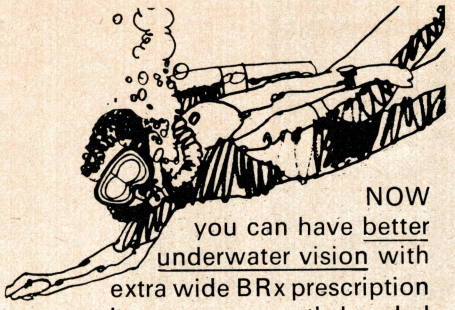
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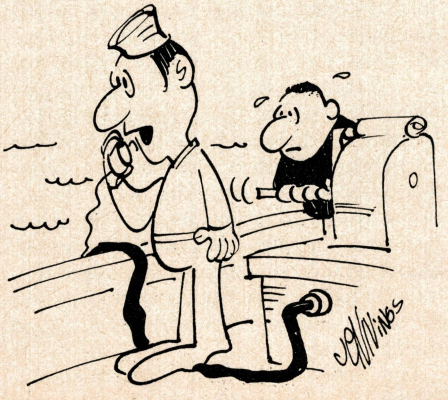
CHAPPELL FORMS FIRM

Jack Chappell, long a key figure in the diving sport and industry, has formed a sales firm as representative for Subsea, Del Mar, Seatec, Aqueon, Electro-Oceanics and other companion lines. Effective June 1, this firm will be calling on dive retailers throughout the Eastern Coastal states and Gulf states.



Nine years in the diving industry, Chappell started in the East Coast as a diving equipment salesman and was later made merchandising manager of AMF Swimaster. Most recently he has been director of the Aqua Lung Dealers Association for U.S. Divers Co. He is a NAUI, YMCA and PADI Instructor and plans to increase regional involvement with all instruction agencies. Jack has served in a legislative liaison and equipment standards formulation capacity for D.E.M.A. for the last three years. He plans to continue involvement in this area. Chappell is also an accomplished underwater photographer.

The company is now in the process of building up a sales force to serve dealers. Each salesman will understand the varied aspects of the diving industry, working hand in hand with dealers, conducting regional seminars stressing merchandising, sales and service to the diving enthusiast.



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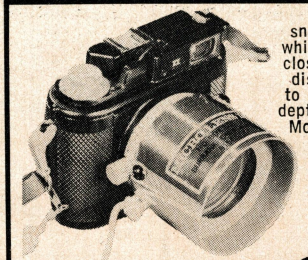
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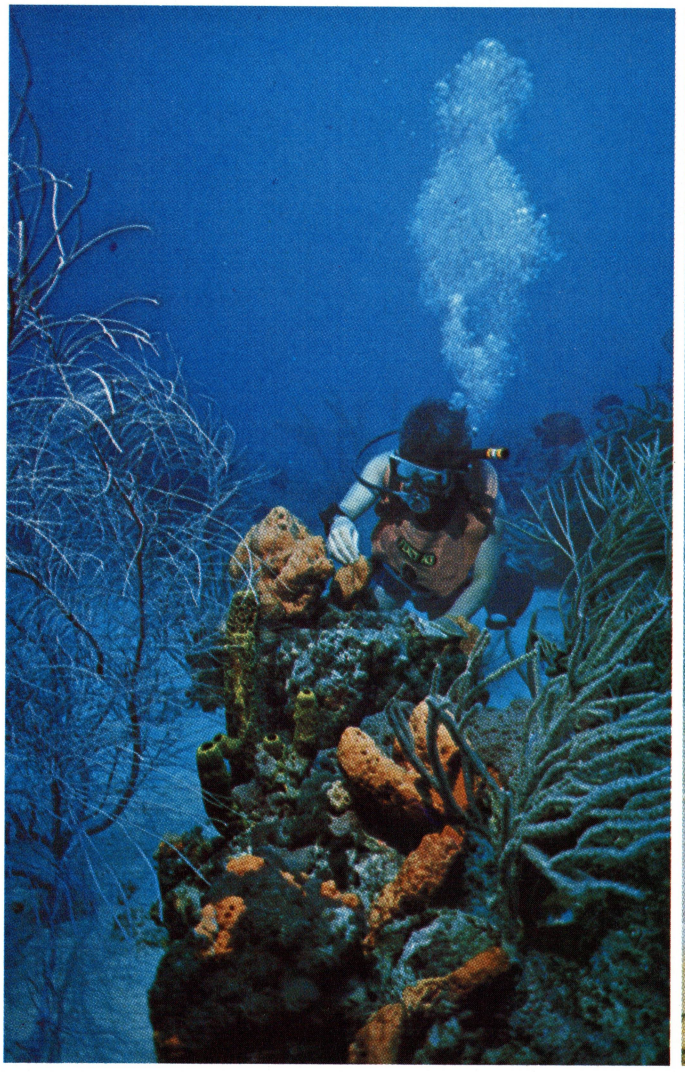
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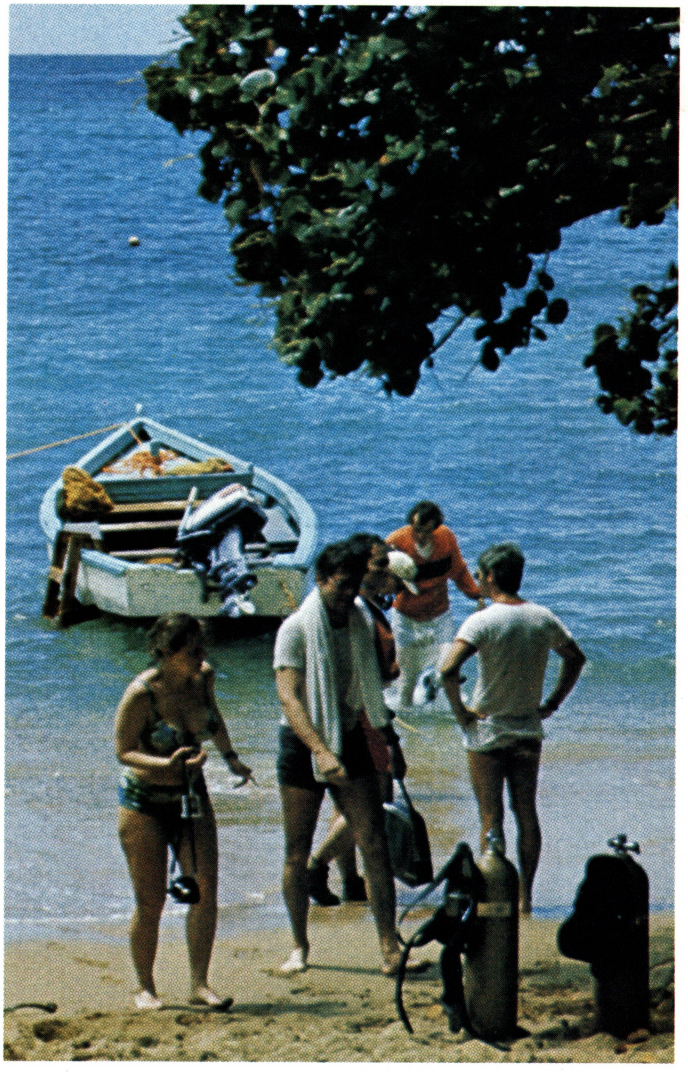


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